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NATIONAL DAM INSPECTION PROGRAM. FAWN LAKE DAM, ID NUMBER PA006--ETC(U)
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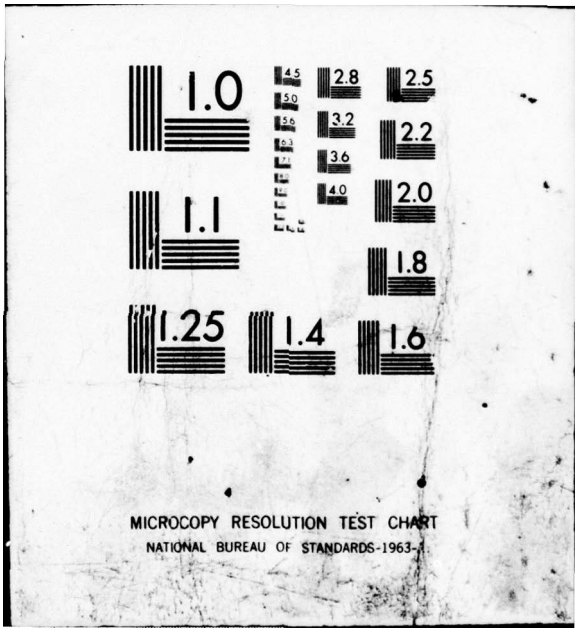
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Fawn Lake Dam, ID Number PA-00693.
Schuylkill River Basin, Plum Creek,
Schuylkill County, Pennsylvania.
Phase I Inspection Report.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam: Fawn Lake Dam
County Located: Schuylkill County
State Located: Pennsylvania
Stream: Plumb Creek
Coordinates: Latitude 40° 35.2' Longitude 76° 11.4'
Date of Inspection: 11 July 1978

ABSTRACT

Fawn Lake Dam is owned by the Lake Wynonah Property Owners Association and is located in South Mannheim Township in Schuylkill County, Pennsylvania. The dam was designed by the original owner, American Realty Service Corporation of Memphis, Tennessee. The embankment was completed on May 12, 1971, and has been in service ever since. The facility is judged to be in reasonably good operating condition.

Calculations indicate that the spillway systems are capable of passing the probable maximum flood (PMF). Therefore, the spillway is considered to be "Adequate".

Seepage was noted emanating from the downstream slope and along the toe of the dam, but there were no indications at this time that this condition is potentially hazardous. No indications of slope distortion, embankment slides or other condition indicative of a potentially unstable embankment were noted. Considering the aforementioned itmes, the following measures are recommended in order of priority.

ABSTRACT

1. Settlement of approximately 10 inches was noted adjacent to the spillway which has reduced the storage capacity of the reservoir and spillway capacity. The settlement is undesirable and it is recommended that the embankment be re-established to its design elevation.

2. It is recommended that the seepage be monitored for signs of turbidity, erosion, or change in quantity. The existing high vegetation and trees should be removed to allow ready observation. Should deteriorating conditions be observed as

a result of seepage, an inverted filter consisting of graded aggregate should be placed in the problem areas and the condition inspected by a registered professional engineer.

3. Periodic checks of the spillway should be made and debris removed as required.

Recommendations concerning the operation and maintenance of the dam are prsented as follows:

1. The owner should develop an operation and maintenance procedure together with an inspection checklist to insure that all items are inspected, operated and maintained on a regular basis.

2. A formal procedure of observation and warning during periods of high precipitation should also be developed and implemented because of the possibility of extreme property damage downstream. In the event of dam failure, loss of life is probable. This procedure should include methods of warning and possibly evacuating residents along Plumb Creek.

Joe H Sleight — 8/26/78

John H. Frederick, Jr., P.E. — Date
Maryland Registration 3701
Woodward-Clyde Consultants

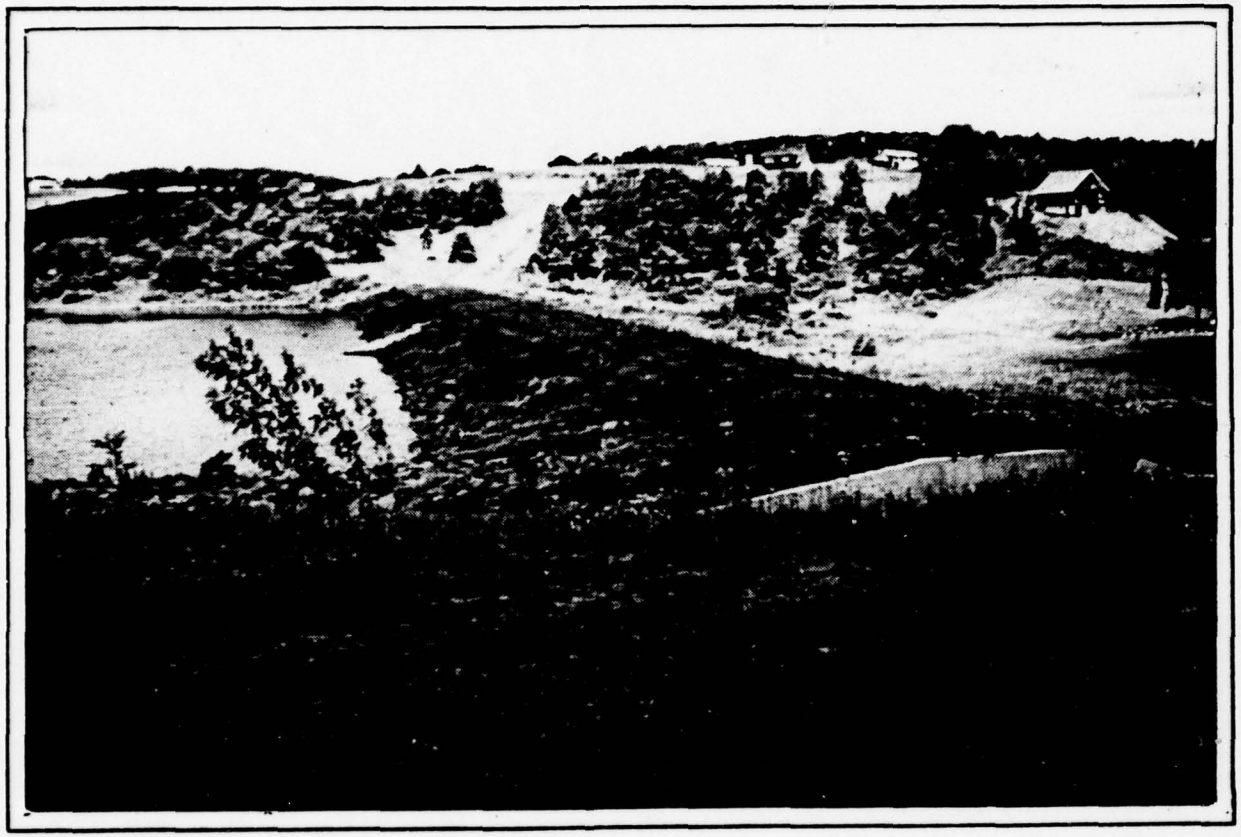
W S Gardner — 8/26/78

William S. Gardner, P.E. — Date
Penna. Registration 004302E
Woodward-Clyde Consultants

APPROVED BY:

J Curtis — 10 Sep 78

C. K. WITHERS — Date
Colonel, Corps of Engineers
District Engineer



OVERVIEW
FAWN LAKE, SCHUYLKILL COUNTY, PENNSYLVANIA

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
FAWN LAKE DAM
NATIONAL ID #PA 00693
DER ID #54-175

SECTION I
PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Fawn Lake Dam is a 44-foot high rolled earth dam across Plum Creek in Schuylkill, Pennsylvania. The dam is 625 feet long with a 26.88 acre reservoir. The dam was designed to use locally available borrow material consisting of sandy clays and contains a cut-off trench located along the dam centerline. A 4-foot thick horizontal filter blanket is located immediately downstream of the cut-off trench and extends to the downstream slope. The elevation of the filter blanket varies along the axis of the dam. The upstream slope is riprapped to elevation 686.

Water is discharged from the dam over the principal spillway, located at the right abutment, when the lake level exceeds elevation 680. The discharge flows over a flat crested weir and down a 187-foot open rectangular concrete chute into a riprapped channel. Water can be discharged through a manually operated sluice gate, into an 18-inch reinforced concrete conduit extending under the dam. Discharge from the conduit flows into a riprapped channel. The principal and pond drain channels converge approximately 300 feet downstream of the dam.

b. Location. The dam is located on Plum Creek in Wayne Township, Schuylkill County, Pennsylvania. The embankment is

located immediately upstream of Lake Wynonah and is located on USGS Quadrangle entitled, "Friedensburg, Pennsylvania," at coordinates N 40° 35.2', W 76° 11.4'. A Regional Location Plan is enclosed as Plate 1, Appendix E.

c. Size Classification. The dam is classified as "Intermediate" by virtue of its 44 foot height.

d. Hazard Classification. A "High" hazard classification is assigned consistent with the potential for property damage and loss of life downstream.

e. Ownership. Lake Wynonah Property Owners Association, RD #1, Auburn, Pennsylvania 17922.

f. Purpose of Dam. The dam was designed solely for recreational purposes.

g. Design and Construction History. The dam was designed by G. K. Jewell and Associates of Columbus, Ohio, and Gannett Fleming Coddry and Carpenter, Inc., of Harrisburg, Pennsylvania, for the original owner, American Realty Service Corporation. Hydrologic and hydraulic engineering was performed for American Realty Services Corporation by Ronald R. Williams and Associates, Inc. Construction drawings and specifications were prepared by the American Realty Service Corporation. The contractor for this dam was Gerbus Brothers Construction Company of Cincinnati, Ohio. Construction supervision was provided by G. K. Jewell and Associates.

The first construction progress report indicates that construction began in September of 1970 and Plum Creek was diverted by October 21, 1970. Earthwork was terminated in November, 1970, due to inclement weather with the embankment to a height of 19 feet. Fill placement resumed in April, 1971, and the embankment was completed on May 12, 1971. Major concrete structures were completed by June 1, 1971, but final completion was delayed due to problems with the sluice gate and other minor items. The Dam Completion Report was issued December 18, 1972.

h. Normal Operating Procedures. Reservoir flows are normally controlled by the spillway. The sluice gate for the pond drain is normally closed; however, this gate does not seat properly and leaks.

1.3 Pertinent Data.

A summary of pertinent data for Fawn Lake Dam is presented as follows.

a.	Drainage Area (sq. miles)	0.98
b.	Discharge at Dam Site (cfs)	
	Max. Known Flood at Site	Unknown
	Design High Water (100 yr. storm)	450
	Minimum Required Flow	0.15
	Max. Discharge (at Top of Dam)	1522
c.	Elevations (above MSL)	
	Top of Dam	690.0
	Design High Water (100 yr. storm)	684.5
	Normal Pool	680.0
	Spillway Weir	680.0
	Outlet Invert	643.6
d.	Reservoir (miles)	
	Length at Normal Pool	0.5
	Fetch at Normal Pool	0.5
e.	Storage (acre-feet)	
	Normal Pool	342.4
	Top of Dam	675.0
f.	Reservoir Surface Area (acres)	
	Normal Pool	26.9
	Top of Dam	39.7
g.	Dam Data	
	Type	Rolled earth with cutoff trench and down stream filter blanket.
	Length	625 feet
	Height	44 feet
	Side slopes	
	Upstream	
	Crest to Elev. 674.0	3:1 (H:V)
	Below Elev. 674.0	3.5:1 (H:V)

	Downstream	
	Crest to Elev. 660	3:1 (H:V)
	Berm Width	8 feet
	Below Elev. 660	3:1 (H:V)
h.	Outlet Works	
	Type	Concrete pressure pipe conduit.
	Sluice Gate	18 inch square
	Pipe Diameter	18 inches I.D.
	Pipe Length	280 feet
i.	Spillway	
	Type	Flat crested weir and concrete chute.
	Weir Width	15 feet

SECTION 2
ENGINEERING DATA

2.1 Design.

a. Data Available. A summary of engineering data on Fawn Lake Dam is presented on the checklist attached as Appendix A. Principal documents containing pertinent data used for this report are as follows.

1. "Report Upon the Application of Lake Wynonah and/or American Realty Service Corporation," by Joseph J. Ellam, Hydraulic Engineer, Department of Environmental Resources.

2. "Soils and Foundation Report, Fawn Lake, Schuylkill County, Pennsylvania," by G. K. Jewell and Associates, Columbus, Ohio.

3. "Design Calculations for Fawn Lake Dam at Lake Wynonah, Inc., in Schuylkill County, Pennsylvania," dated July 3 to July 8, 1970, by American Realty Services Corporation, Memphis, Tennessee.

4. Construction plans stamped "As-Built," dated July 17, 1970, by American Realty Service Corporation, Memphis, Tennessee.

5. "Specifications for Fawn Lake at Lake Wynonah, Inc., Schuylkill County, Pennsylvania," dated September, 1970, by American Realty Service Corporation, Memphis, Tennessee.

6. Miscellaneous letters, correspondence, memos, including construction progress reports located in the Department of Environmental Resources main offices in Harrisburg, Pennsylvania.

b. Design Features. The principal design features are illustrated on the plan, profile and cross-section plates of the embankment and appurtenant structures that are enclosed in Appendix E, as Plates 2 through 6. These plates were reproduced from the "As-Built" plans. A discussion of the design features is also presented in Section 1.2, "Description of Project."

The dam is a homogeneous rolled earth embankment which includes a cut-off trench. A 4-foot thick filter blanket extends from immediately downstream of the cut-off trench to the downstream slope.

The upstream side of the embankment has a slope of 3H:1V from the crest at elevation 674 below which the slope is 3.5H:1V. The downstream side of the dam has a slope of 3H:1V with an 8-foot berm at elevation 660.0. The crest of the dam is 15 feet wide. Stability analyses were performed using assumed soil strength parameters. Results of the analyses indicate an upstream slope factor of safety of 1.02 for rapid draw down with the downstream slope having a factor of safety of 1.62 for steady state seepage.

Design features of the spillway system and concrete conduit are discussed in Section 5.

2.2 Construction.

A discussion of the construction history is presented in Section 1.2. Construction was performed by Gerbus Brothers Construction Company of Cincinnati, Ohio, and was supervised by Mr. Milton H. Moos and Mr. Richard D. Barnes of G. K. Jewell and Associates at Columbus, Ohio. State files contained construction progress reports and photographs of various stages of construction.

2.3 Operation Data.

The Construction Permit requires a minimum downstream flow of 0.15 cfs (95,000 gallons per day) unless reservoir inflow is less than this amount. If reservoir inflow is measured, the discharge may be reduced accordingly. However, no outlet feature was incorporated into the design to provide this flow other than manual operation of the sluice gate. Operational records of the water level or downstream discharge are not maintained by the Owner.

2.4 Evaluation.

a. Availability. Engineering data reproduced in this report and studied for this investigation was provided by the Pennsylvania Department of Environmental Resources.

b. Adequacy. The design and construction data provided was adequate to evaluate the dam and appurtenant structures.

c. Validity. There is no reason to question the validity of the data. Although reasonable values were used, it is noted that the stability analysis was performed using assumed soil property values rather than values determined by laboratory testing.

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. The observations and comments of the field inspection team are contained in the checklist enclosed herein as Appendix B and are summarized and evaluated as follows. In general, the appearance of the facility indicates that the dam and its appurtenances were constructed in accordance with construction specifications. Seepage was noted and is discussed in the following sub-sections.

b. Dam. During the visual survey, there were no indications or evidence observed of distortions in alignment or grade that would be indicative of movement of the embankment or foundation. There were no surface cracks or misalignment observed. Some settlement (10 ± inches) of backfill around the concrete spillway chute was noticed. No significant erosion was observed. The riprap was in good condition and stable. Seepage was noted along the downstream toe of the embankment and at the left abutment, which was also reported in a DER inspection report made following filling of the reservoir. Wet, marshy areas were observed downstream of the toe. The seepage locations are shown on Sheet 5(a), Appendix B.

c. Appurtenant Structures.

1. Principal Spillway. The spillway, consisting of a flat crested weir, open rectangular chute and riprapped downstream channel, was in good condition. No significant distress or movement of concrete was noted.

2. Emergency Spillway. The principal spillway also functions as the emergency spillway.

3. Outlet Works. Water was flowing through the discharge pipe and could not be inspected. The 18-inch sluice gate was not completely seated, and leaked. The gate was exercised and found to be generally in good condition with exception of complete seating and the need for lubrication.

It is noted that the roadway used for access to the sluice gate is located immediately downstream of the dam and would be underwater in an extreme event, thus preventing access to the pond drain gate via this route. It is understood

that other roads are available to gain access to the dam during extremely heavy rainfall.

Seepage was noted to emanate from the drain around the conduit outlet structure. The flow was exiting within the filter blanket material and was clear.

d. Reservoir. Reconnaissance of the reservoir disclosed no evidence of significant siltation, slope instability or other features that would significantly affect the capacity of the reservoir. The drainage basin slopes were well vegetated, and many areas were covered with dense woods.

e. Downstream Channel. Immediately downstream of the conduit, discharge from the pipe flows into a riprapped channel with no evidence of erosion. Flows from the spillway converge with the conduit discharge 300 feet below the toe of the dam. The flow is diverted through two small culverts located beneath a roadway between Fawn Lake Dam and Lake Wynonah. There is little debris or obstructions noted in the channel. A house is located immediately downstream and to the left of the discharge channel.

3.2 Evaluation.

In summary, the visual survey of the dam disclosed no evidence of apparent past or present movements to indicate instability of the dam. The seepage observed was clear and does not appear to be indicative of a potentially hazardous condition, but could develop into one. Therefore, the turbidity, erosion at exit points and quantity of flow should be monitored. Small trees and bushes growing on the downstream slope should be removed periodically. Debris observed in the spillway should also be removed.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures.

Normal operating procedures do not require a dam tender. The water level is maintained under normal conditions by the spillway weir. The weir is 15 feet long and is located 37 feet upstream of the centerline of the dam at elevation 680.0. During the winter months the reservoir level is lowered several feet to protect the dock facilities from ice. No facilities have been included to provide the required minimum downstream flow other than the sluice gate. Based on visual observations, it is judged that seepage is greater than the minimum required flow of 0.15 cfs.

The 18-inch sluice gate is located at elevation 651.68 and can be used to drain the lake or lower the level of the lake. The gate is manually operated with the control valve on the upstream slope just below the crest of the dam. Access to the valve is normally from the left abutment. However, access can be achieved by crossing the weir section of the spillway during low flows or be climbing the downstream slope.

4.2 Maintenance of the Dam.

The dam is maintained by the Lake Wynonah Property Owners Association and is periodically checked by the Pennsylvania Department of Environmental Resources. No operations or maintenance manuals were found during the inspection.

4.3 Maintenance of Operating Facilities.

Maintenance of the operating facilities (sluice gate) is also performed by the Lake Wynonah Property Owners Association. No maintenance manual was found during the investigation.

4.4 Warning Systems in Effect.

There are no formal warning systems or procedures established to be followed during periods of heavy rainfall. It is understood that responsible people are always in the

area and available if a potentially hazardous condition develops.

4.5 Evaluation.

Although there are no written operating procedures, current procedures appear satisfactory with the following noted exceptions. Development of procedures for measuring and recording downstream flows would be helpful to maintain the minimum required flows and to monitor seepage quantities. However, it is not believed necessary that minimum flows be required since the discharge channel flows directly into Lake Wynonah and both lakes are owned by the same association. Written procedures should be developed for periodic inspection of the dam and outlet structures. This procedure should include a detailed list of items to be checked. Since a formal warning procedure does not exist, one should be developed and implemented during periods of extreme rainfall.

SECTION 5
HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. Design calculations were available for review. The watershed is small, 624 acres; sixty-four percent of the watershed is within the Association's (Property Owners) development. The area along the shore line has been built up, while away from the shore fewer homes have been constructed. Elevations range from 1020 in the upper reaches to 680 at reservoir level.

The spillway was designed to have a maximum discharge capacity of not less than 1400 cfs, the value required by the Pennsylvania Department of Environmental Resources (Department of Forests and Waters), "C" curve. The probable maximum flood was calculated to be 8,000 cfs, a value judged excessive. The 12-hour 100-year frequency storm was determined and flood routed through the reservoir. The 100-year storm reservoir water surface elevation was determined to be 684.5 feet. In accordance with the criteria established by Federal (OCE) Guidelines, the recommended spillway design flood for this "Intermediate" size dam and "High" hazard potential classification is the probable maximum flood (PMF).

b. Experience Data. No records are kept of water surface elevations, rainfalls, or inflow into the reservoir. During Tropical Storm Agnes, June 1972, discharge flooded out the road immediately downstream but no estimate was made of the depth of water over the spillway.

c. Visual Observations. On the date of the inspection, the only condition observed that would indicate the outlet capacity to be significantly reduced during a flood occurrance is approximately 10 inches of settlement of the dam crest adjacent to the spillway wall, which reduces the maximum capacity of the spillway. Observations regarding the downstream channel, spillway condition and reservoir are located in Appendix B.

d. Overtopping Potential. Although the original design calculated the PMF inflow hydrograph, the PMF storm was not routed through the spillway. It is judged that the computed value is excessive (See Appendix C). The computed maximum spillway capacity, with the reservoir water level at the top of the dam, is 1,522 cfs; the calculations are judged

adequate. The overtopping potential was estimated by transposing the peak PMF from a similar watershed and using an approximate flood routing method. The estimated PMF peak inflow is 2,020 cfs. Results indicate that the spillway capacity and available flood water storage are such that the PMF will pass the structure without overtopping.

Under existing conditions, with the reservoir water level at the minimum embankment elevation adjacent to the spillway, the spillway capacity is reduced to about 1,340 cfs. It is estimated that the dam would be overtopped by a 90 percent PMF storm.

e. Spillway Adequacy. The spillway is considered "Adequate" as it will pass the PMF without overtopping as designed, but is considered "Inadequate" under existing conditions. The tailwater elevation during passing of the PMF is estimated to be approximately 35 feet or more below the top of the dam.

f. Downstream Conditions. The discharge channels from the pond drain and the spillway converge approximately 300 feet downstream of the axis of the dam before the flow passes through two culverts under Lone Star Drive, a private road within the development (See Photo 3). It is estimated that 65 cfs would overtop the road. Approximately 200 feet further downstream, the flow enters Lake Wynonah at a marina area. There is presently one house between the two lakes that would be subject to damage in case of dam failure (but probably would not be damaged by large flows). As houses along Lake Wynonah are set 50 feet back from the water's edge, few would be subject to damage from either failure or large flows from Fawn Lake; however, Lake Wynonah Dam would possibly be severely damaged or breached from failure of Fawn Lake Dam during passing of the PMF. By virtue of these possibilities, the dam is considered a "High" hazard potential structure.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. The visual observations did not indicate any existing embankment stability problems. The riprap on the upstream slope was stable and appeared to be in good condition. There were no exterior signs indicating that the filter blanket drainage system was not operating as designed.

As discussed in Appendix B, seepage and wet marshy areas were noted. These areas should be monitored for turbidity, erosion and change in flow rates.

The spillway structure was inspected and evaluated to be in good condition. The discharge conduit could not be observed except at the discharge structure. The riprapped channels from the spillway and conduit were observed to be in good condition.

b. Design and Construction Data. Available design documentation included a hydrologic/hydraulic design report and a soils and foundation report containing results of stability analyses performed using assumed soil strength parameters. Also contained in the files were construction drawings stamped "As-Built." Stability and hydrologic/hydraulic calculations were reviewed for completeness and reasonableness of the assumptions and other input criteria. They were found to be adequate. With the exception of the excessive PMF inflow discussed in Section 5, paragraph d, all other calculations are assumed correct.

Construction progress reports indicated that the embankment materials were compacted to an average of at least 95 percent of the maximum dry density as determined by the Standard Proctor moisture-density determination (ASTM D 698). The exterior features of the dam and appurtenances agreed with the "As-Built" drawings.

c. Operating Records. No operating records are maintained.

d. Post-Construction Changes. There are no reports or evidence that modifications were made to this dam.

e. Seismic Stability. This dam is located in Seismic Zone 1. Normally, it can be considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake conditions. By definition of the Corps of Engineers' criteria, the seismic stability of the dam is also adequate.

SECTION 7
ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Evaluation. The visual inspection and review of design and "As-Built" documentation indicates that the dam embankment, foundation and appurtenant structures are in good condition. The hydrologic/hydraulic computations indicate that the dam will pass the PMF. Therefore, the discharge systems of the structure are considered "Adequate."

b. Adequacy of Information. The design information available for this inspection was adequate to evaluate this dam. Construction data was adequate although limited materials testing data was available.

c. Urgency. It is concluded that the recommendations presented in Section 7.2 be implemented as soon as practical.

7.2 Remedial Measures.

a. Facilities. The following recommendations are presented in order of priority but does not infer that the latter recommendations are unimportant.

1. Settlement of approximately 10 inches was noted adjacent to the spillway which has reduced the storage capacity of the reservoir. It is recommended that embankment be re-established to its design elevation.

2. It is recommended that the seepage be collected, monitored and recorded for signs of turbidity, erosion, or change in quantity. The existing high vegatation and trees should be removed to allow ready observation. Should deteriorating conditions be observed as a result of seepage, an inverted weighted filter consisting of graded aggregate should be placed in the problem areas and the condition inspected by a registered professional engineer.

3. Periodic checks of the spillway should be made and debris removed as required.

b. Operation and Maintenance Procedures. A formal procedure of observation and warning during periods of high precipitation should be developed and implemented. This procedure should include a method of warning downstream residents and implementing appropriate procedures at Lake Wynonah Dam. If abnormally high flows are expected, procedures for evacuating persons immediately downstream should be implemented. Currently, there is only one dwelling which would be immediately affected by an extreme event.

The Owner should also develop an operations, maintenance and inspection procedure, including an inspection checklist, to insure that all critical items are inspected and maintained.

APPENDIX

A

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM *Fawn Lake Dam*

ID # *PA 00693*

ITEM	REMARKS
AS-BUILT DRAWINGS	*Five construction drawings prepared by American Realty Service Corporation and stamped "As-Built" were found in DER files and included; location plan, plan and typical section, boring logs and cut-off trench, spillway, service (drain) pipe and slide gate. Several duplicate drawings not stamped "As-Built" were also included.*
REGIONAL VICINITY MAP	*Included on the cover sheet of construction drawings. Also, refer to USGS quadrangle entitled "Friedensburg, Pennsylvania" included as Plate 1 of Appendix E.*
CONSTRUCTION HISTORY	*Nine "Construction Progress Reports" by G.K. Jewell Associates were included in the files along with nine "Memorandum" by DER reflecting inspection of construction progress.*
TYPICAL SECTIONS OF DAM	*Included on sheet 1 of 5 of construction drawings.*
OUTLETS - PLAN DETAILS CONSTRAINTS DISCHARGE RATINGS	*Data included on construction drawings and report entitled "Design Calculations for Fawn Lake Dam" both prepared by American Realty Service Corporation.*
RAINFALL/RESERVOIR RECORDS	*None*

ITEM	REMARKS
DESIGN REPORTS	1) *Soils and Foundation Report, dated August 28, 1970, by G.K. Jewell and Associates.* 2) *Design Calculations for Fawn Lake Dam, dated July 3, 1970 to July 8, 1970.*
GEOLOGY REPORTS	1) *Soils and Foundation Report , dated August 28, 1970, by G.K. Jewell and Associates.*
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES (1)	*H&H calculations included in report entitled "Design Calculations for Fawn Lake Dam". Dam stability analyses included in report entitled "Soil and Foundation Report".* (1) *Seepage through the embankment was estimated using grain size analyses to postulate permeability values.*
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	*This information included in the "Soil and Foundation Report", dated August 28, 1970 by G.K. Jewell and Associates.* *Some field density tests were included with the first "Construction Progress Report". However, data is limited and only a summary was included in subsequent reports.*
POST-CONSTRUCTION SURVEYS OF DAM	*None*
BORROW SOURCES	*Test pits were indicated and located in the "Soil and Foundation Report" but no records were found to confirm borrow sources.*

ITEM	REMARKS
MONITORING SYSTEMS	*None*
MODIFICATIONS	*None*
HIGH POOL RECORDS	*None*
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	*Two inspection DER inspection reports were found in the files; one immediately following completion and another in 1977.*
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	*None*
MAINTENANCE OPERATION RECORDS	*None*

ITEM	REMARKS
SPILLWAY PLAN	*Included on "As-Built" construction drawings.*
SECTIONS	
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	*Included on "As-Built" construction drawings.*

APPENDIX

B

CHECK LIST
VISUAL INSPECTION
PHASE I

Name Dam *Fawn Lake Dam* County *Schuylkill* State *Pennsylvania* National ID # *PA 00693*

Type of Dam *Rolled Earth* Hazard Category *I (High)*

Date(s) Inspection *11 July 1978* Weather *Clear and Warm* Temperature *80's*

Pool Elevation at Time of Inspection *680.0* M.S.L. Tailwater at Time of Inspection *644.0* M.S.L.

Inspection Personnel:

Brady Bisson *Vincent McKeever*

Mary Beck *John H. Frederick, Jr.*

John Boschuk, Jr.

John Boschuk, Jr. Recorder

Remarks:

Mr. Gerald Miller, Director of Lakes and Dams, was on site and provided assistance during the inspection.

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	*N/A*	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	*N/A*	
DRAINS	*N/A*	
WATER PASSAGES	*N/A*	
FOUNDATION	*N/A*	

CONCRETE/MASONRY DAMS

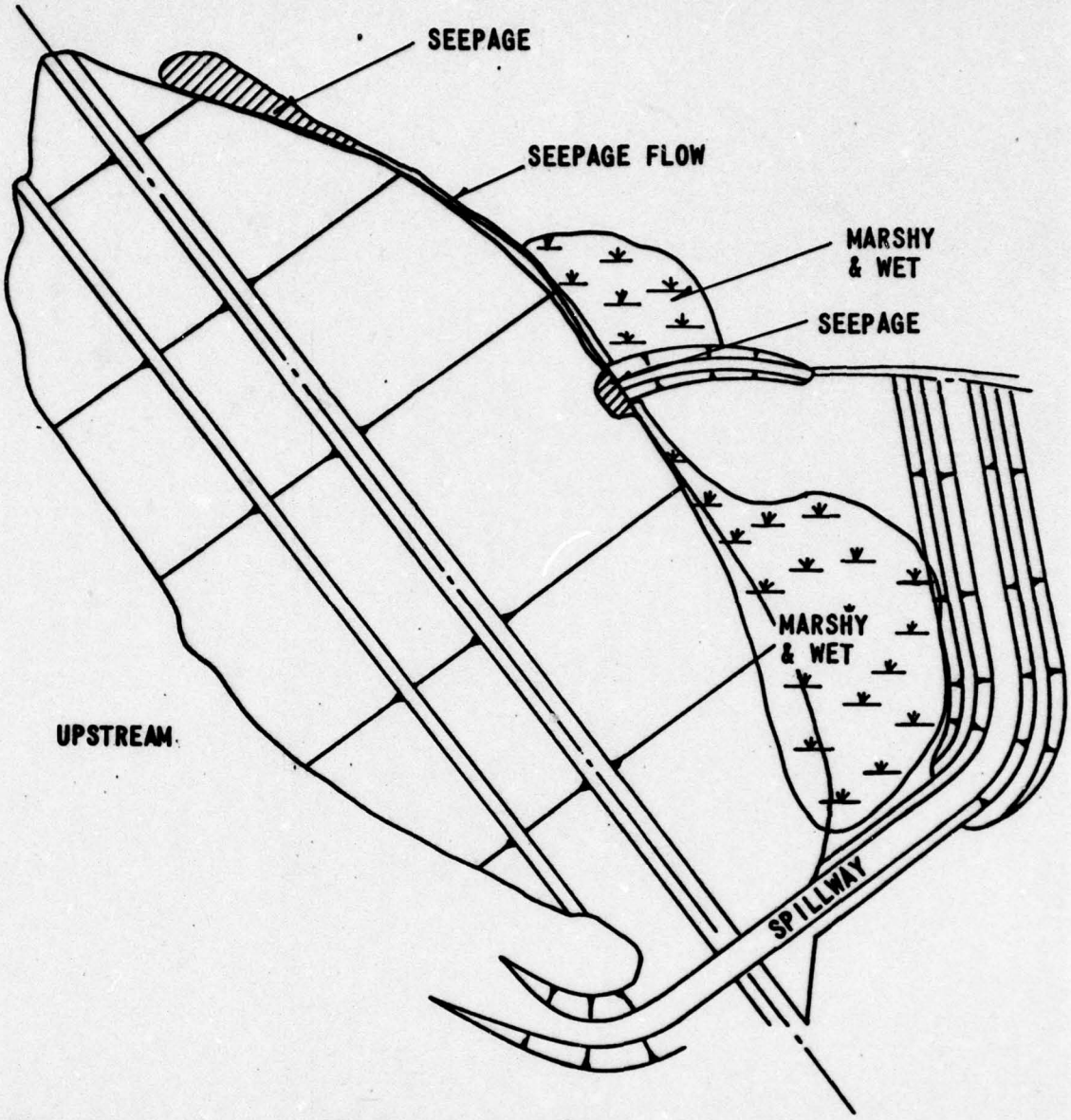
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	*N/A*	
STRUCTURAL CRACKING	*N/A*	
VERTICAL AND HORIZONTAL ALIGNMENT	*N/A*	
MONOLITH JOINTS	*N/A*	
CONSTRUCTION JOINTS	*N/A*	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	*None observed.*	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	*None observed.*	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	*Slight erosion above the toe (to the left abutment side of the pond drain outlet) where the phreatic surface intersects the surface of the embankment and in the path at seepage flows from left abutment side of the embankment.*	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	*No misalignment or distortion observed during the inspection.*	
RIPRAP FAILURES	*None observed.*	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	*No misalignment, sloughing, or distortions observed.*	
ANY NOTICEABLE SEEPAGE	*See sheet 5a. Clear seepage was observed along the downstream embankment contact with natural ground. Concentrated areas of seepage were observed on the left abutment initiating slightly below the apparent normal pool and around the pond drain pipe outlet structure. The areas of concentrated seepage on the left abutment is not covered with graded filter stone. Black willow trees mark the edge of the seepage zone to the right of the discharge structure. The area immediately downstream of the embankment toe was gradually wet and marshy with areas of standing water noted. The seepage rate, erosion and turbidity should be monitored.*	
STAFF GAGE AND RECORDER	*None.*	
DRAINS	*Rock drains appear to be functioning properly. There was no evidence observed to suggest that the interior drainage system was not functioning as designed.*	



NOTE: Due to the type of seepage occurring, the rate of seepage could not be estimated.

SEEPAGE LOCATION PLAN
FAWN LAKE DAM

OUTLET WORKS

(POND DRAIN)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	*The outlet conduit is buried under the embankment and could not be inspected.*	
INTAKE STRUCTURE	*No cracking, spalling, or significant deterioration observed on the portion of the structure above the waterline.*	
OUTLET STRUCTURE	*No cracking, spalling, or significant deterioration observed on the exposed portion of the structure.*	
OUTLET CHANNEL	*The riprapped channel appears stable. Debris should be removed from the channel.*	
GATE VALVE	*The gate valve was inspected and exercised. Flow was observed downstream. The valve needs to be greased but it is otherwise in good condition.*	

UNGATED SPILLWAY
(PRINCIPAL SPILLWAY)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	*No cracks, distortion or significant deterioration were observed.*	
APPROACH CHANNEL	*The approach channel is rock lined, stable and free of debris.*	
DISCHARGE CHANNEL	*Retaining walls were stable with no signs of significant rotation or displacement. Some shrinkage cracks were observed which should be monitored. If seepage develops through the cracks, the cracks should be sealed.*	
BRIDGE AND PIERS	*None.*	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	*N/A*	
APPROACH CHANNEL	*N/A*	
DISCHARGE CHANNEL	*N/A*	
BRIDGE AND PIERS	*N/A*	
GATES AND OPERATION EQUIPMENT	*N/A*	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	*None.*	
OBSERVATION WELLS	*None.*	
WEIRS	*None.*	
PIEZOMETERS	*None.*	
OTHER	*None.*	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	*Moderate to steep slopes with grass to the water's edge. All structures are required by the Owners Association to be at least 50 feet from the lake. Several floating and pile docks are along the shore line which could float downstream and partially clog the spillway during an extreme event.*	
SEDIMENTATION	*No significant sedimentation was observed.*	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	*There is only 500 feet between the toe of this dam and the headwaters of Lake Wynonah Reservoir. There is one house on the left abutment side which could be affected by high flows, or high levels of Lake Wynonah.*	
SLOPES	*The area is relatively flat between the two dams.*	
APPROXIMATE NO. OF HOMES AND POPULATION	*There is one home between the dam and the lower reservoir which would be destroyed in case of dam failure, and possible damage could occur to the downstream Lake Wynonah Dam. There is also a boat dock at the end of Lake Wynonah Reservoir which would be damaged.*	

APPENDIX

C

FAWN LAKE

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: *Approx. 25% wooded, potential for 60% residential development.*

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): *680.0 (342 Acre-Feet)*

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): *690.0 (675 Acre-Feet)*

ELEVATION MAXIMUM DESIGN POOL: *684.5-12 hour 100 year storm.*

ELEVATION TOP DAM: *690.0*

SPILLWAY:

a. Elevation *680.0*

b. Type *Broad crested weir with chute discharge channel.*

c. Width *14.5 feet*

d. Length *187 feet*

e. Location Spillover *Right Abutment*

f. Number and Type of Gates *None*

POND DRAIN:

a. Type *18 inch ID concrete pipe with drop inlet flush with embankment.*

b. Location *295 feet west of centerline of the chute spillway*

c. Entrance inverts *652 ±*

d. Exit inverts *643.55*

e. Emergency draindown facilities *The pond drain.*

HYDROMETEOROLOGICAL GAGES:

a. Type *None*

b. Location

c. Records

MAXIMUM NON-DAMAGING DISCHARGE: *1522 cfs.*

DAM SAFETY ANALYSIS
HYDROLOGIC/HYDRAULIC DATA

Date: 7/26/78
By: HFB
Sheet: 2 of 11

DAM Fawn Lake Nat. ID No. PA 00693 DER No. 54-175

ITEM/UNITS	Permit/Design Files (A)	Calc. from Files/Other (B)	Calc. from Observations (C)
1. Min. Crest Elev., ft.	690.0		
2. Freeboard, ft.			
3. Spillway(1) Crest Elev, ft.	680.0		
3a. Secondary(2) Crest Elev, ft.	—		
4. Max. Pool Elev., ft.			
5. Max. Outflow(3), cfs	1522		
6. Drainage Area, mi²	0.98		0.96
7. Max. Inflow(4), cfs			2020
8. Reservoir Surf. Area, Acre	26.88		
9. Flood Storage(5) Acre-Feet	393.0		
10. Inflow Volume, Acre-Feet			1232

Reference all figures by number or calculation on attached sheets:

Example: 3A - Drawing No. xxx by J. Doe, Engr., in State File No. yyyy.

NOTES:

(1) Main emergency spillway.

(2) Secondary ungated spillway.

(3) At maximum pool, with freeboard, ungated spillways only.

(4) For columns B, C, use PMF.

(5) Between lowest ungated spillway and maximum pool.

Date: 7/26/78
By: MFB
Sheet: 3 of 11

HYDROLOGIC/HYDRAULIC CALCULATIONS (cont.)

Items (from sheet 2)	Source
1A, 3A, 6A	As-Built Drawings dated July 1970
9A, 5A, 8A	Design Calculations American Realty Service Corp. June 1970
6C	USGS Map Friedensburg (1968)
7A, 10A	See calculations, this Appendix

Classification (Ref - Recommended Guidelines for Safety Inspection of Dams)

1. The hazard potential is rated as HIGH as there would be loss of life if the dam failed.
2. The size classification is Intermediate based on its height.
3. Spillway design flood, based on size and hazard classification, is the probable maximum flood (PMF).

Hydrology and Hydraulics Analysis

1. Items of original design extracted from design calculations

   a. Drainage area = 624 Ac.
      CN No. 82

   b. Rating curves
      Spillway - sheet 7
      Service pipe - sheet 9

   c. PMF calculated peak inflow - 8000 cfs
      100 yr. inflow hydrograph calculations indicate peak inflow - 1268 cfs

   d. Flood routing of 100 yr. storm indicates maximum reservoir elevation of 6645 ft. and discharge of 450 cfs

2. Evaluation of Design Items

a. Drainage area supported by USGS Map. CN judged valid for total residential development

b. Original spillway calculations neglected the fact that once the head on the weir is greater than 6 ft, water will enter chute over the side walls.

Maximum Head at a point in chute where flow passes thru critical = 11 ft.

$$\frac{V_c^2}{2g} = \frac{1}{3} H_e = 3.67$$

$$V_c = 15.37 \text{ ft/sec}$$

$$Q_c = 1690 \text{ cfs}$$

Therefore, assume original calculations adequate.

Service Pipe (Pond Drain) calculations not reviewed as the capacity of the 18-inch pipe is not significant during an extreme event.

c. PMF calculations produced a value judged excessive, therefore peak PMF inflow is estimated from a comparative watershed. Information supplied by Corps of Engineers, Baltimore District.

West Branch of Schuylkill
D.A. = 40 sq. miles
estimated PMF inflow = 7200 cfs

$$\left(\frac{0.98}{40}\right)^{0.8} 7200 \cong 2020 \text{ cfs for Fawn Lake}$$

d. Evaluation of 100 year inflow hydrograph and flood routing not necessary for this study

BY MFB DATE 2/26/78 SUBJECT Fawn Lake Dam SHEET 6 OF 11
CHKD. BY MFB DATE 3/25/78 Hydrology / Hydraulics JOB No.

3. Evaluation of overtopping potential

PMP = 25.5 inches - 6 hr storm (design calculations)
for CN = 82, runoff ~ 23.7 inches
(Fig. A-4, p. 542, "Design of Small Dams")

Volumn of inflow = $\frac{23.7 \text{ in.}}{12 \text{ in/Ft.}}$ 624 = 1232 Ac-Ft

Max. inflow = 2020 cfs (from above)

Max. outflow = 1322 cfs (from design calculations)

Available flood storage = 333.0 Ac. (from design calculations)

Required storage = (see sheets 10 & 11)

$\left(1 - \frac{1322}{2020}\right)$ 1232 = 307 Ac-Ft < 333.0 Ac-Ft.

Therefore, the dam will not over-top during the PMF and the spillway is "ADEQUATE"

Under existing conditions - reduced height between weir and top of dam Q = 1340 cfs, V_S = 290 Ac-Ft (sheet 8a)

$V_2 = \left(1 - \frac{1340}{2020}\right)$ 1232 = 415 > 290 Ac-Ft.

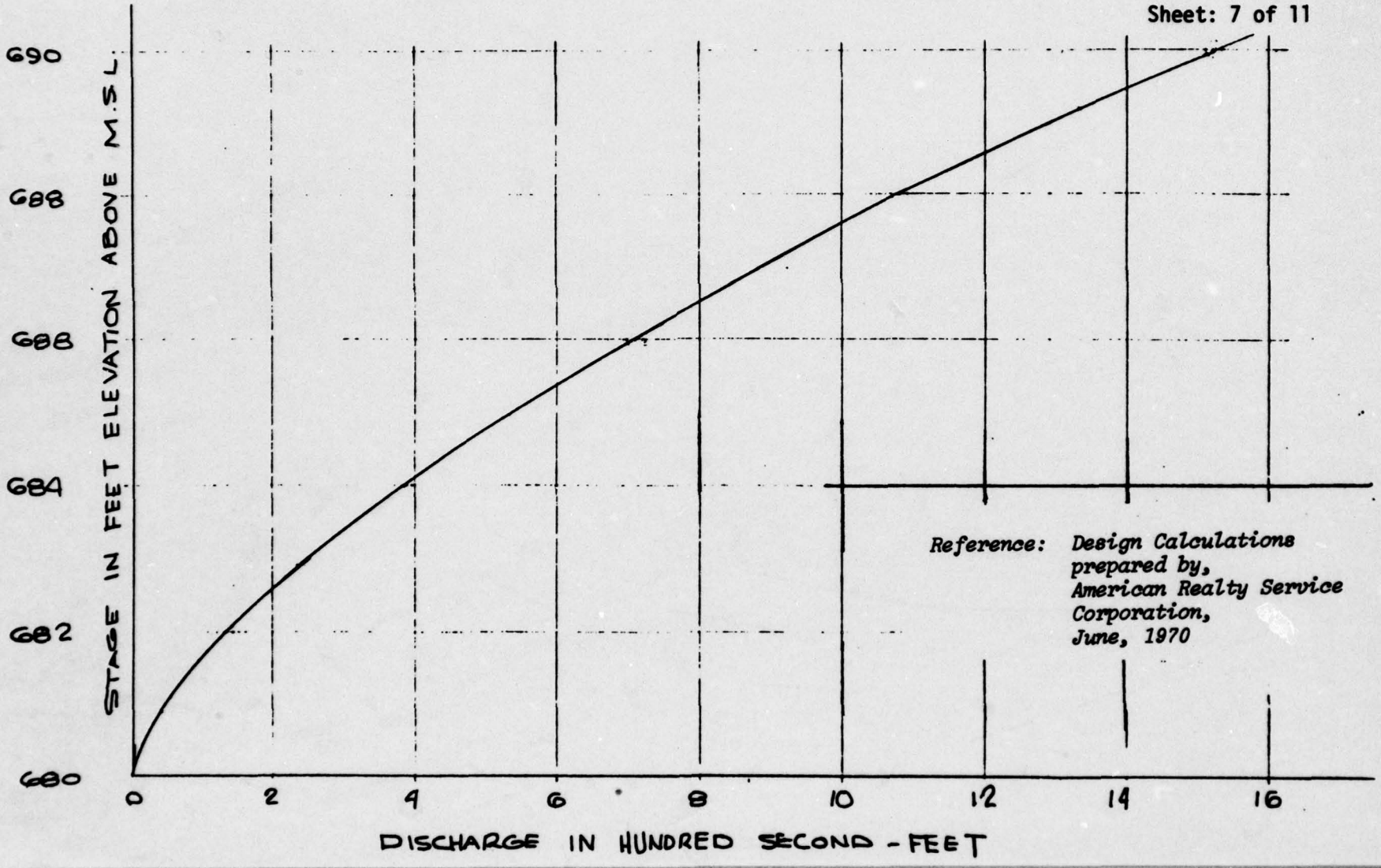
at 90% PMF, Q = 1818 V_S = 1109 Ac-Ft.

$V_2 = \left(1 - \frac{1340}{1818}\right)$ 1109 = 291 ~ 290 available

4. Downstream conditions

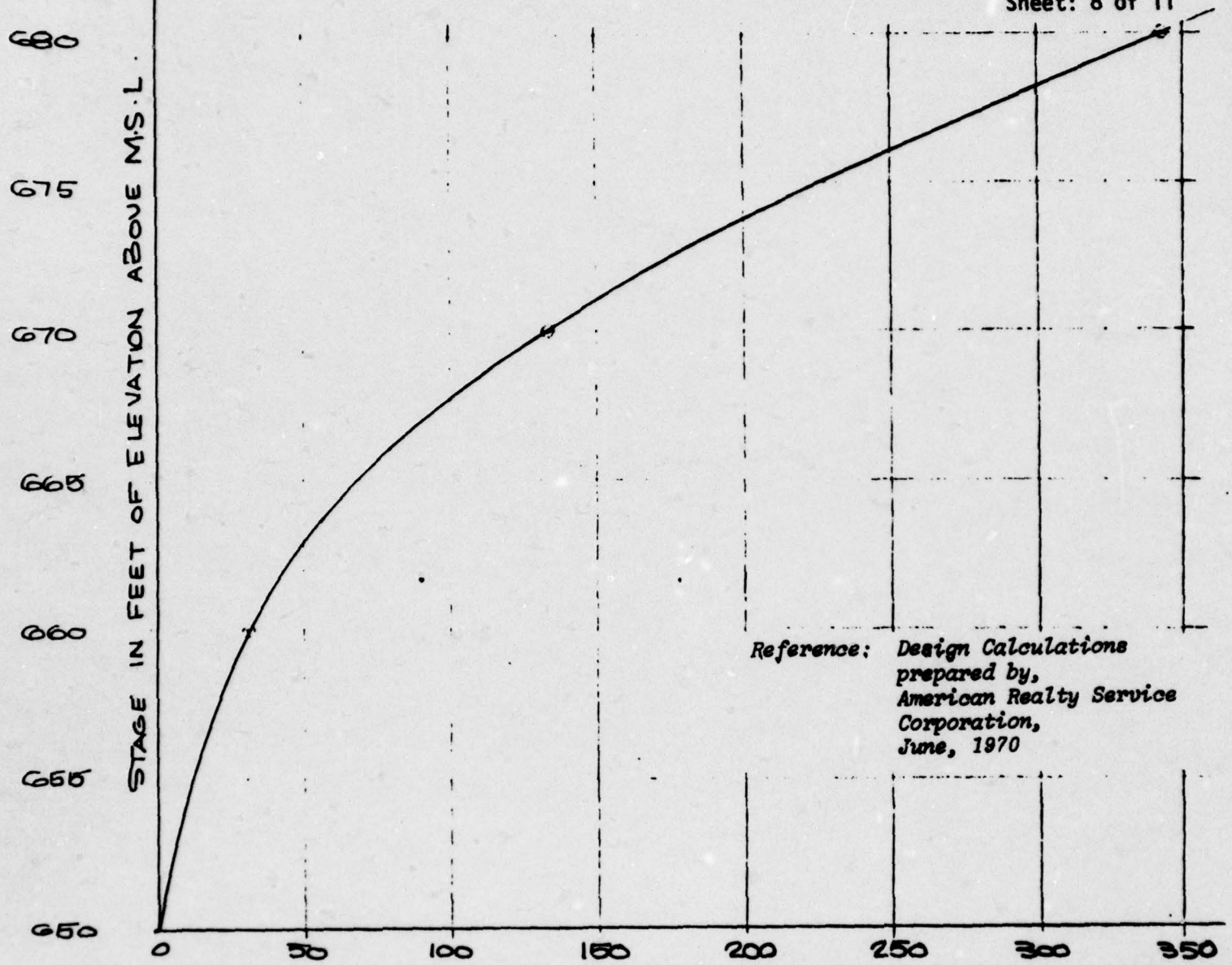
Discharge goes under private road via two corrugated metal culvers, a 4ft. CMP half buried with silt with an approximate capacity of 30 cfs and a 3ft. CMP with an estimated capacity of 35 cfs. for a total culvert capacity of 65 cfs

STAGE - DISCHARGE CURVE FOR FAWN LAKE SPILLWAY



Reference: Design Calculations prepared by, American Realty Service Corporation, June, 1970

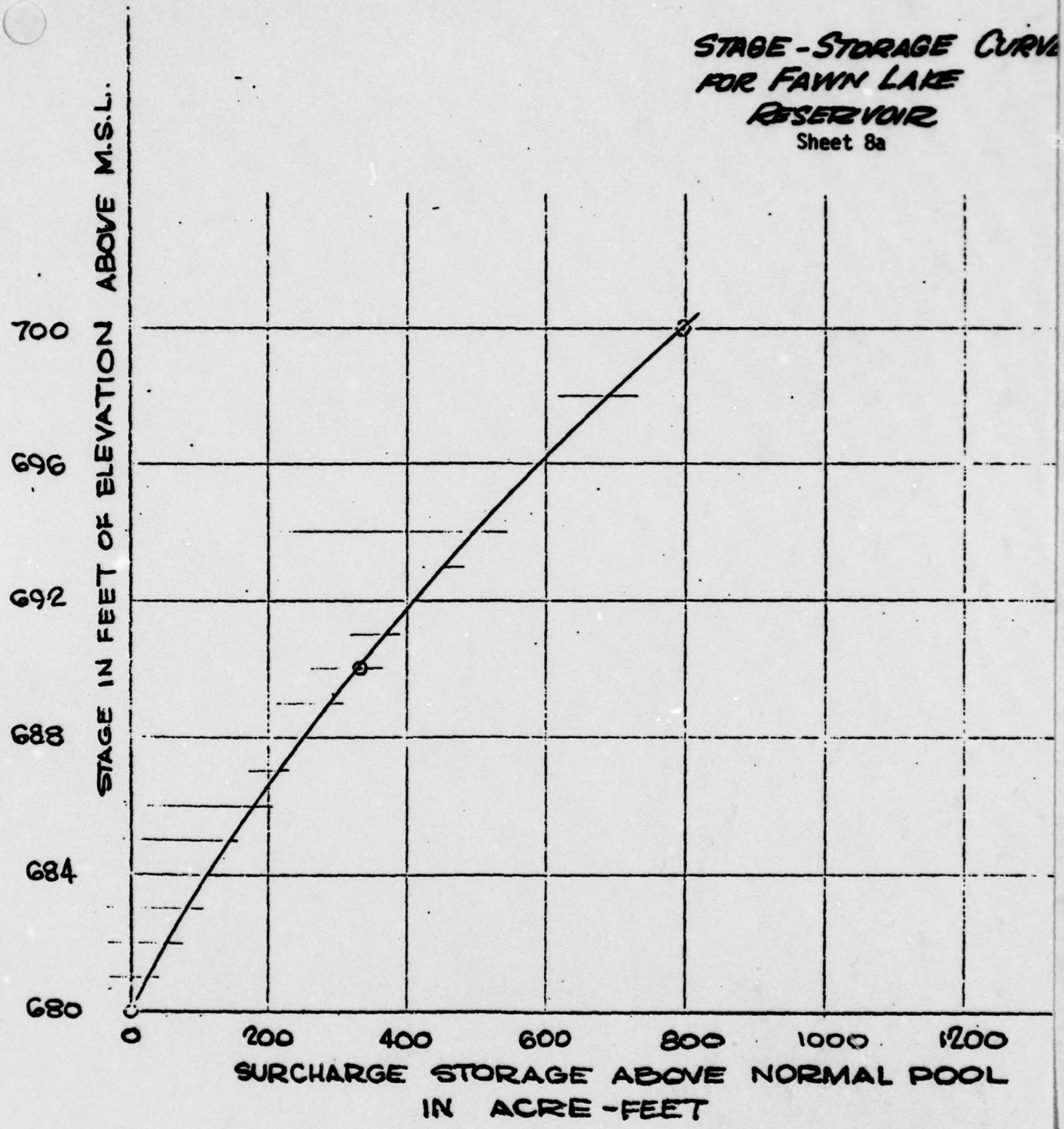
STAGE - STORAGE CURVE FOR FAWN LAKE RESERVOIR



Reference: Design Calculations prepared by, American Realty Service Corporation, June, 1970

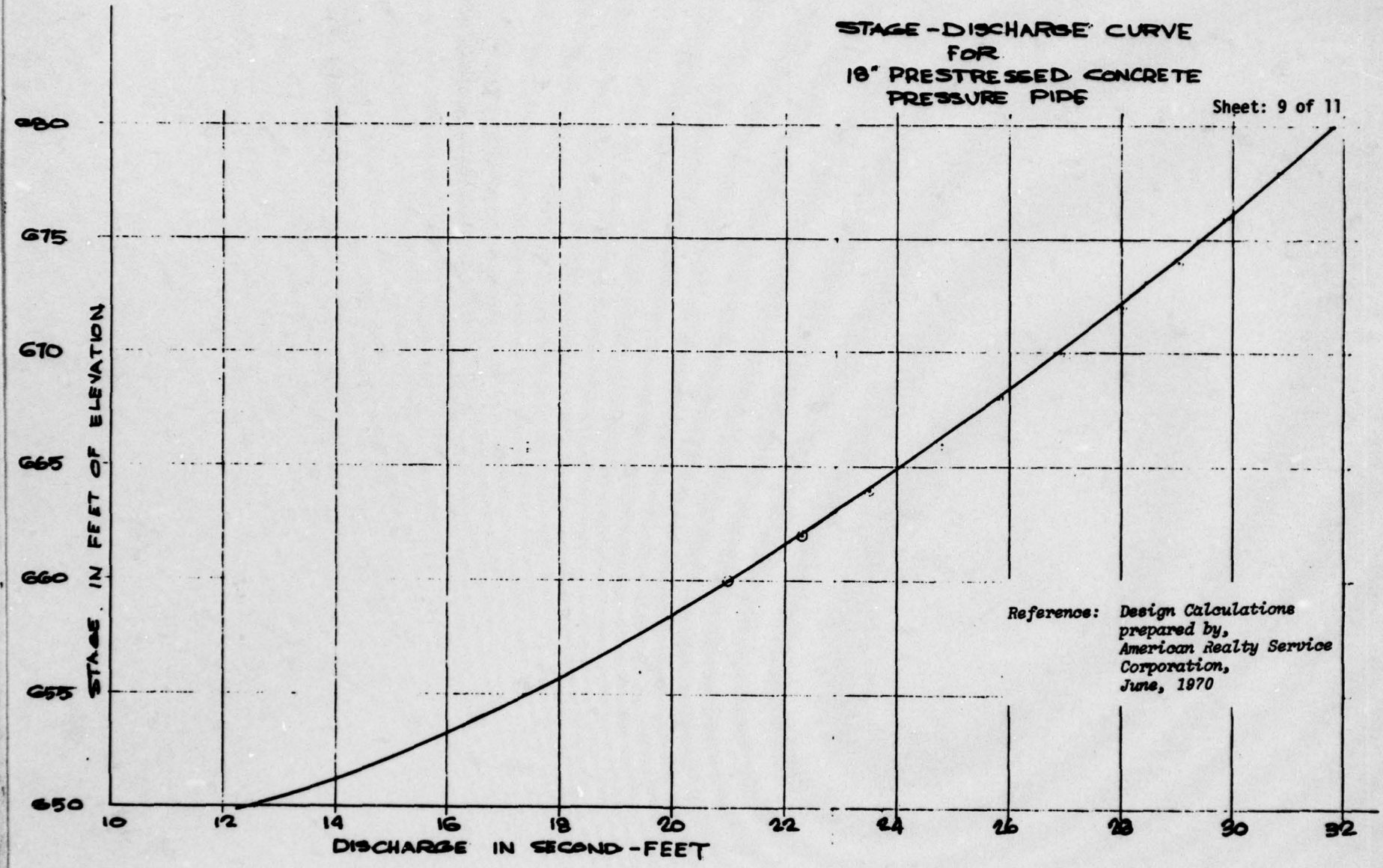
STAGE-STORAGE CURVE FOR FAWN LAKE RESERVOIR

Sheet 8a

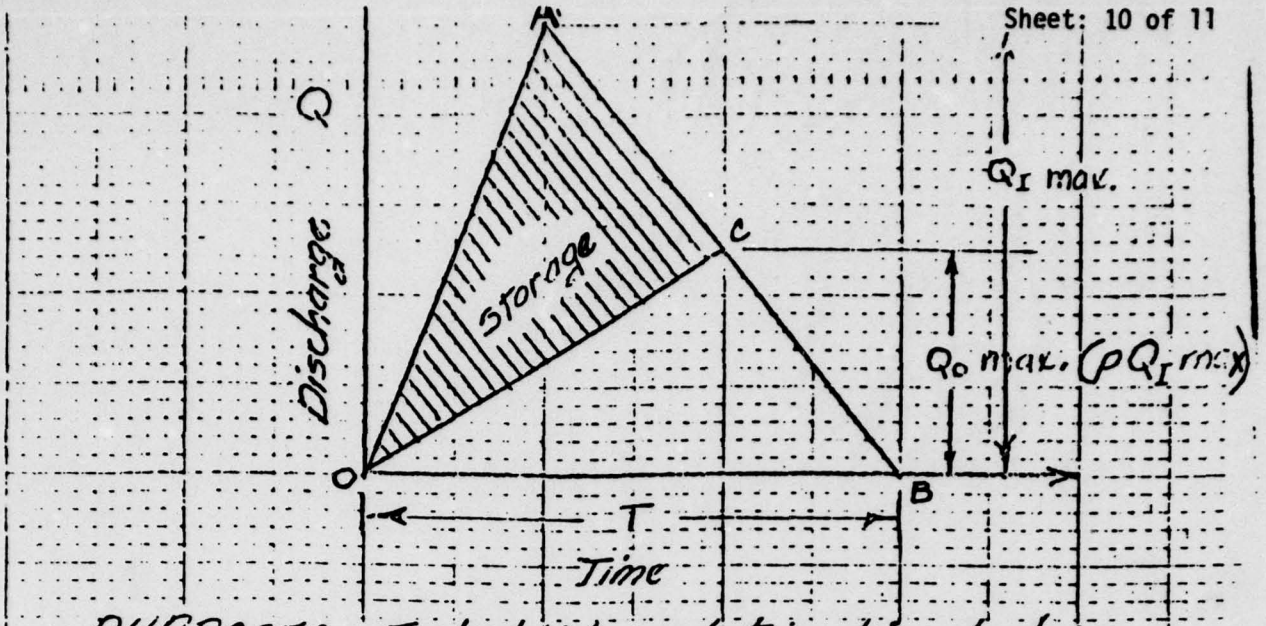


Reference: *Design Calculations prepared by, American Realty Service Corporation, June, 1970*

STAGE-DISCHARGE CURVE FOR 18" PRESTRESSED CONCRETE PRESSURE PIPE



Reference: Design Calculations prepared by, American Realty Service Corporation, June, 1970



PURPOSE: Establish relationship between maximum spillway discharge and storage required to pass flood hydrograph without exceeding maximum pool level.

$$\frac{\Delta AOC}{\Delta AOB} = \frac{\Delta AOB - \Delta COB}{\Delta AOB} = 1 - \frac{\Delta COB}{\Delta AOB}$$

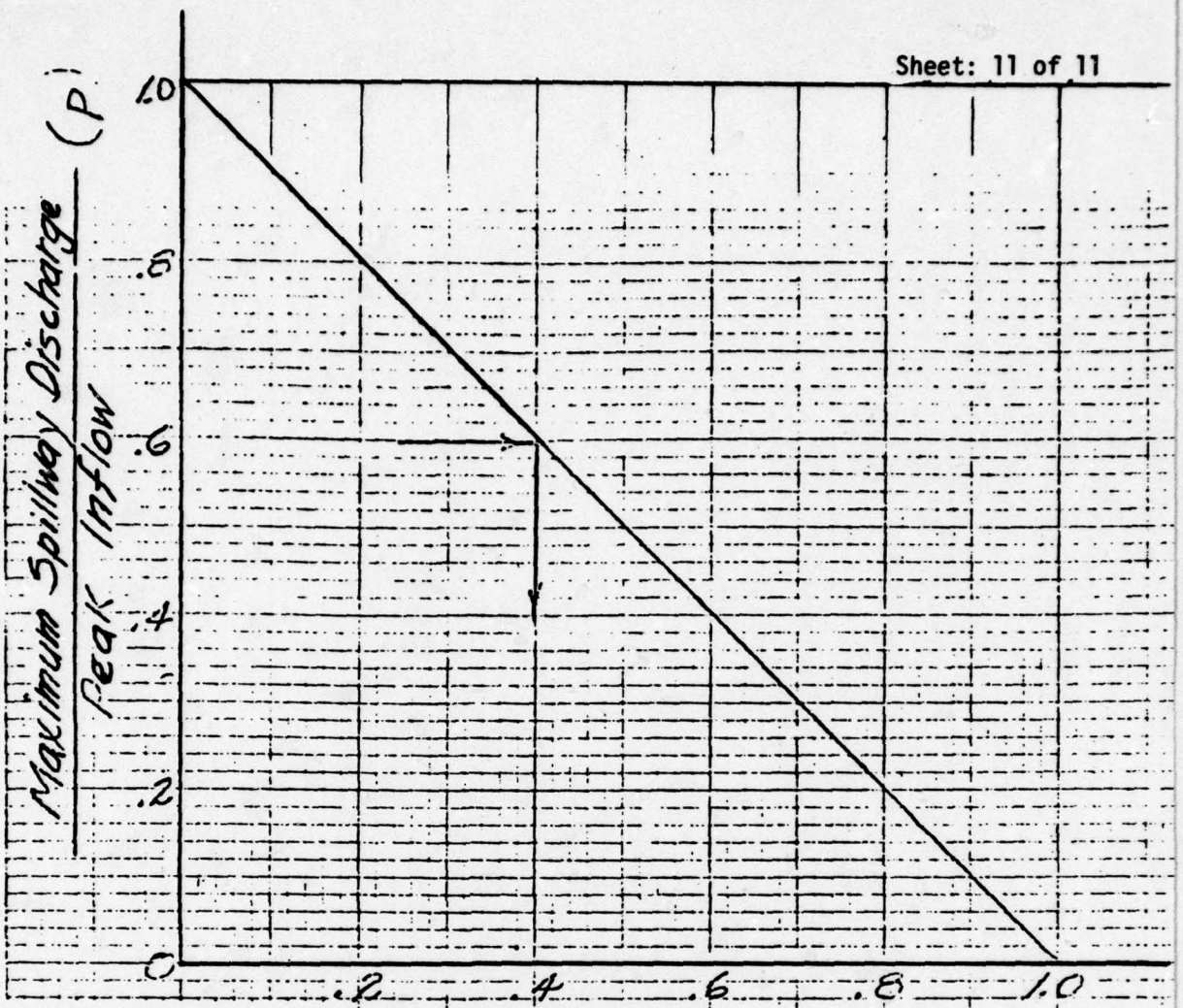
$$\frac{\Delta AOC}{\Delta AOB} = 1 - \frac{T \rho Q_I \text{ max}/2}{T\ Q_I \text{ max}/2} = 1 - \rho$$

$$\Delta AOC = (1-\rho)\ \Delta AOB \quad \text{where } 0 \le \rho \le 1.0$$

ρ	ΔAOC
1.00	0
0.75	0.25 ΔAOB
0.50	0.50 ΔAOB
0.25	0.75 ΔAOB
0	1.00 ΔAOB

REFERENCE

PRELIMINARY ENGINEER TECHNICAL LETTER NO. 1110-2-
25 January 1978



Steps to obtain required reservoir to pass inflo... hydrograph without overtopping dam.

1. Obtain maximum spillway discharge
2. Develop inflow hydrograph
3. Compute relationship of maximum spillway capacity to peak inflow
4. Read relationship of required reservoir storag... to volume of inflow hydrograph from curve

page 2 of 2

APPENDIX

D

VIEW OF POND DRAIN VALVE MECHANISM

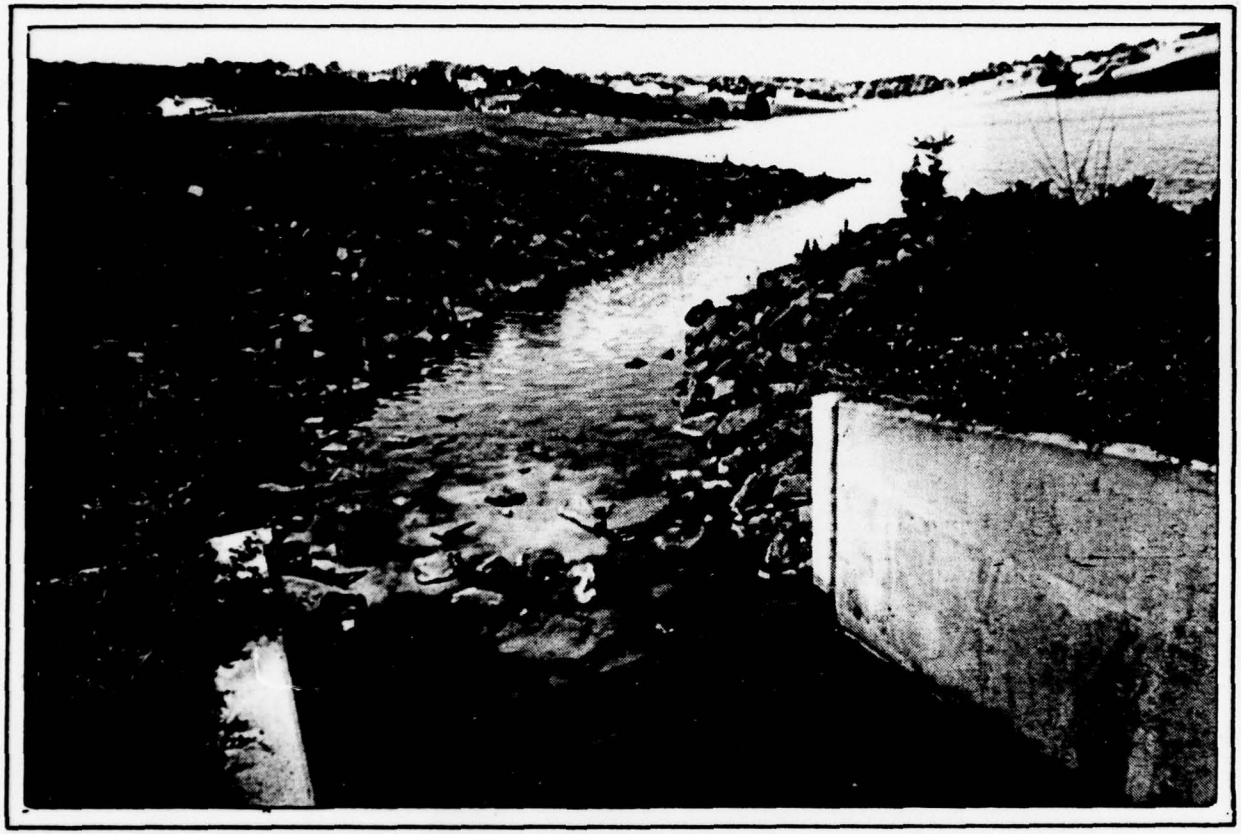
PHOTOGRAPH NO. 1

VIEW OF POND DRAIN OUTLET SYSTEM.
WATER IS MUDDY BECAUSE DRAIN WAS
OPENED TO TEST SYSTEM.

PHOTOGRAPH NO. 2

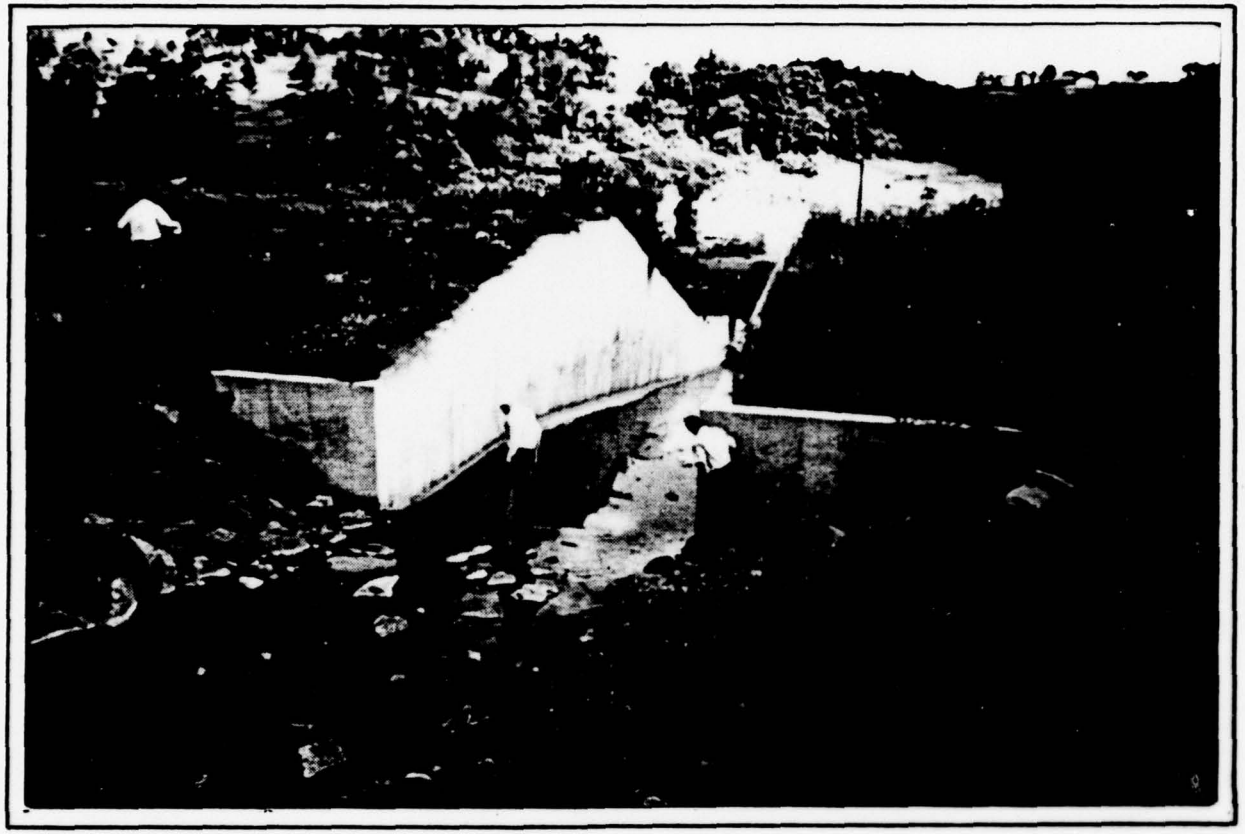
VIEW OF POND DRAIN OUTLET CHANNEL.
NOTE DISCHARGE UNDER ROADWAY AND
HOME ON LEFT, SUBJECT TO FLOODING.

PHOTOGRAPH NO. 3



INTAKE CHANNEL OF PRINCIPAL SPILLWAY.
NOTE CONTROL WEIR AT CHANNEL ENTRANCE.

PHOTOGRAPH NO. 4

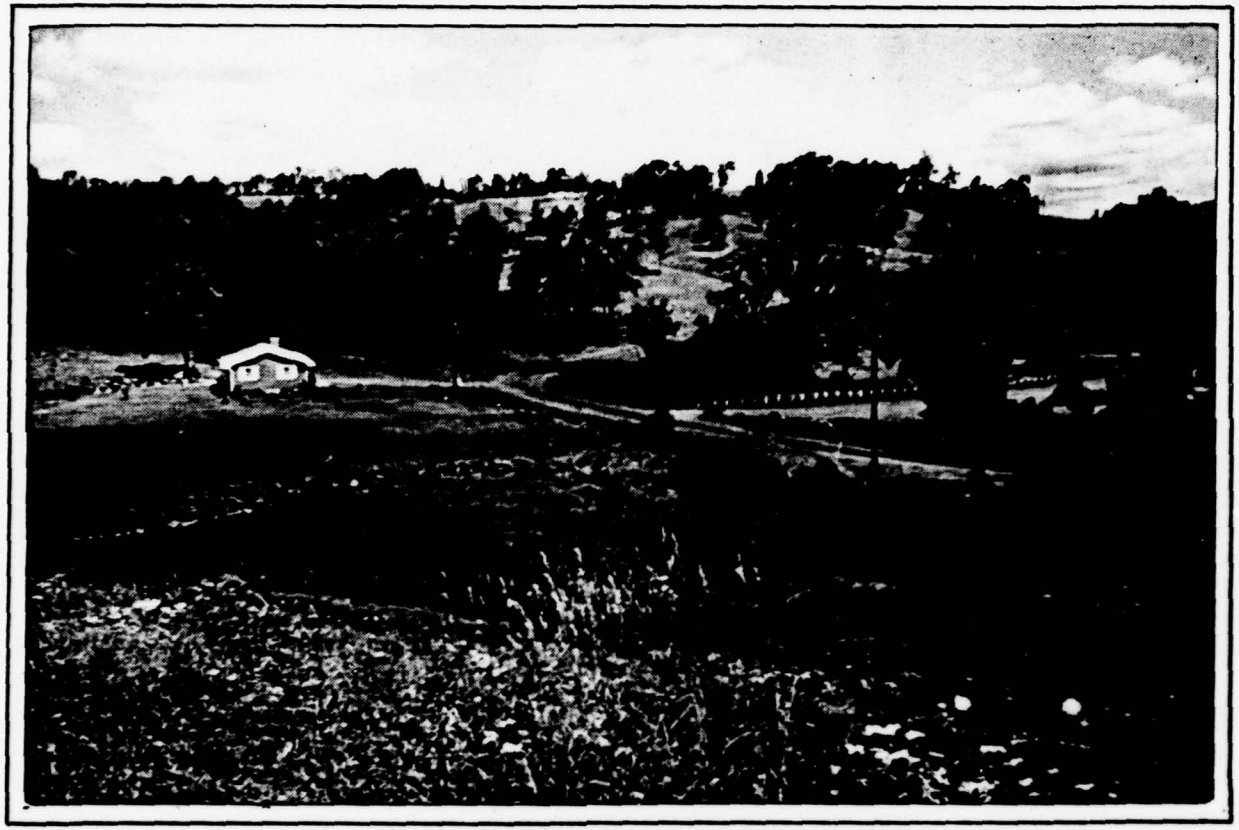


LOOKING DOWNSTREAM THROUGH
PRINCIPAL SPILLWAY.

PHOTOGRAPH NO. 5

LOOKING UPSTREAM THROUGH PRINCIPAL SPILLWAY. NOTE DENSE GROWTH ADJACENT TO WINGWAY WHERE SOIL IS WET.

PHOTOGRAPH NO. 6

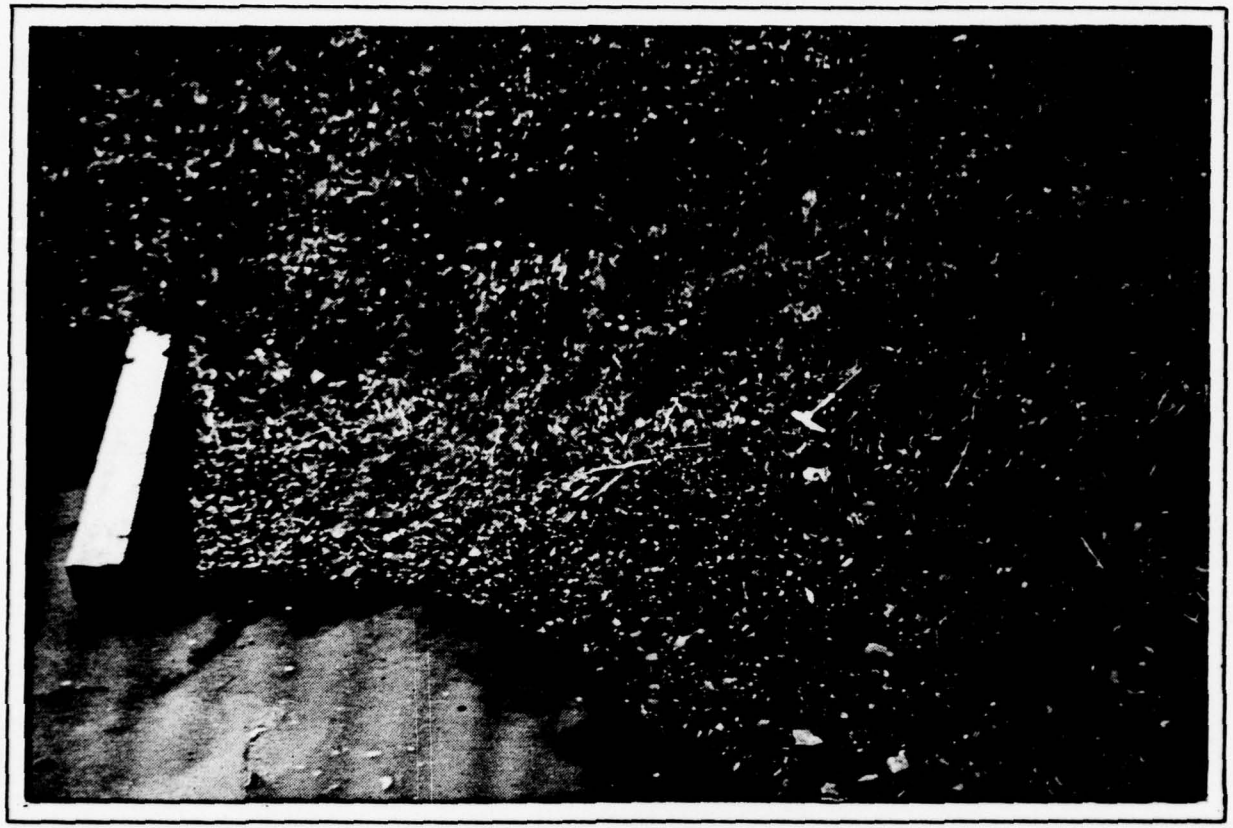


VIEW OF DOWNSTREAM AREA BETWEEN TOE OF DAM AND HEADWATERS OF LAKE WYNONAH. SPILLWAY DISCHARGES FLOW THROUGH CULVERTS UNDER LONESTAR DRIVE.

PHOTOGRAPH NO. 7

SEEPAGE ALONG LEFT SIDE OF DAM ALONG TOE.

PHOTOGRAPH NO. 8

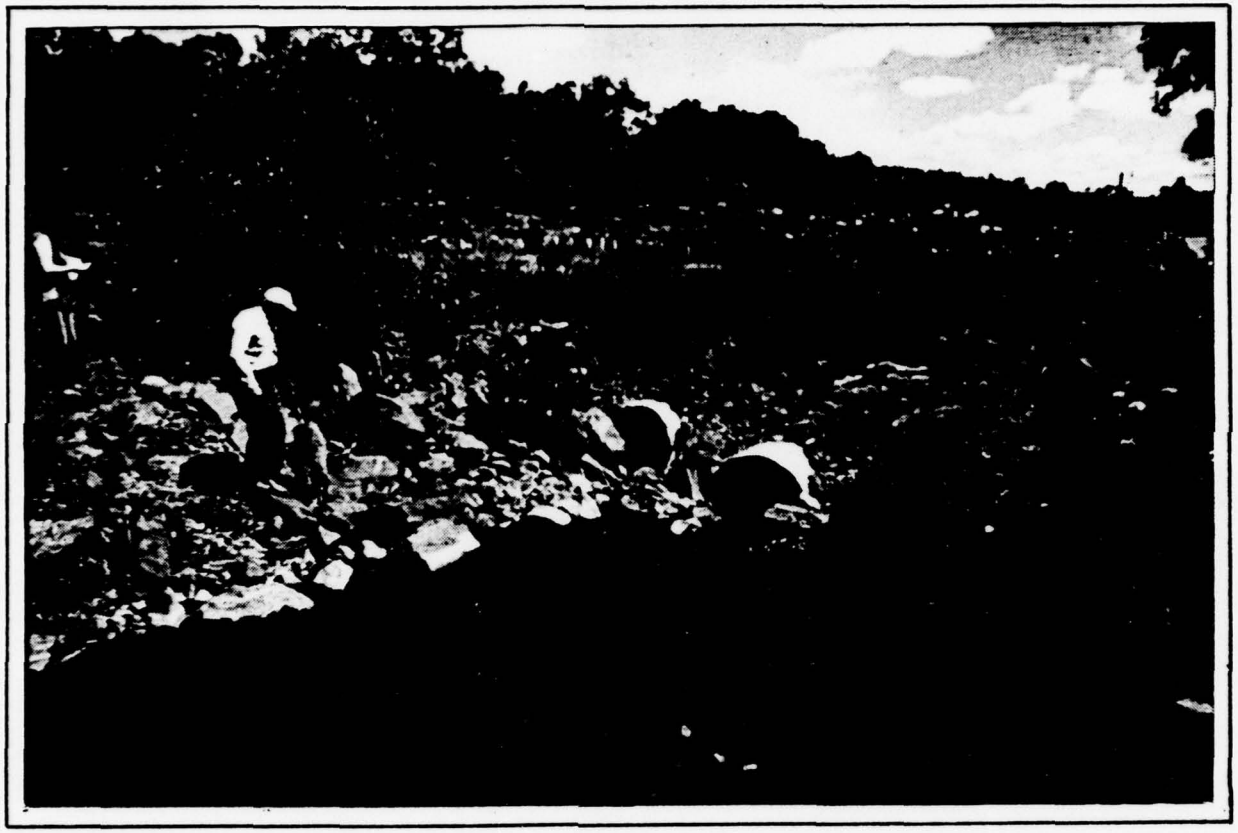


SEEPAGE AROUND POND DRAIN OUTLET
STRUCTURE.

PHOTOGRAPH NO. 9

VIEW OF SEEPAGE ON RIGHT SIDE OF DAM. NOTE TOE SEEPAGE DRAINING INTO THE STILLING BASIN. WILLOW TREES DENOTE OTHER SOURCES OF SEEPAGE BEYOND THE TOE AND OCCASIONALLY ON THE EMBANKMENT.

PHOTOGRAPH NO. 10

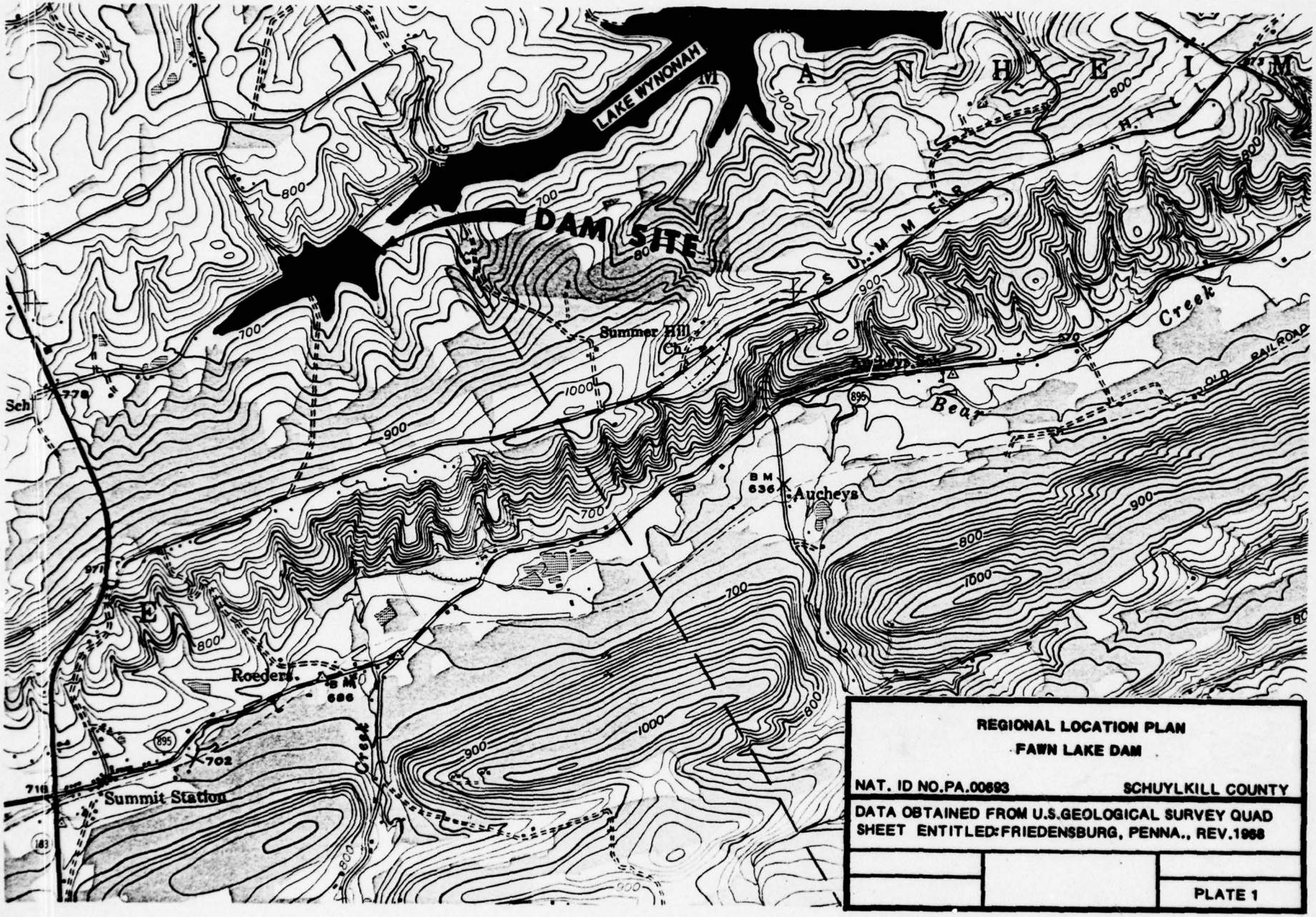


DISCHARGE OF BOTH THE POND DRAIN AND
PRINCIPAL SPILLWAY FLOW THROUGH
THESE CULVERTS UNDER LONESTAR DRIVE.

PHOTOGRAPH NO. 11

APPENDIX

E



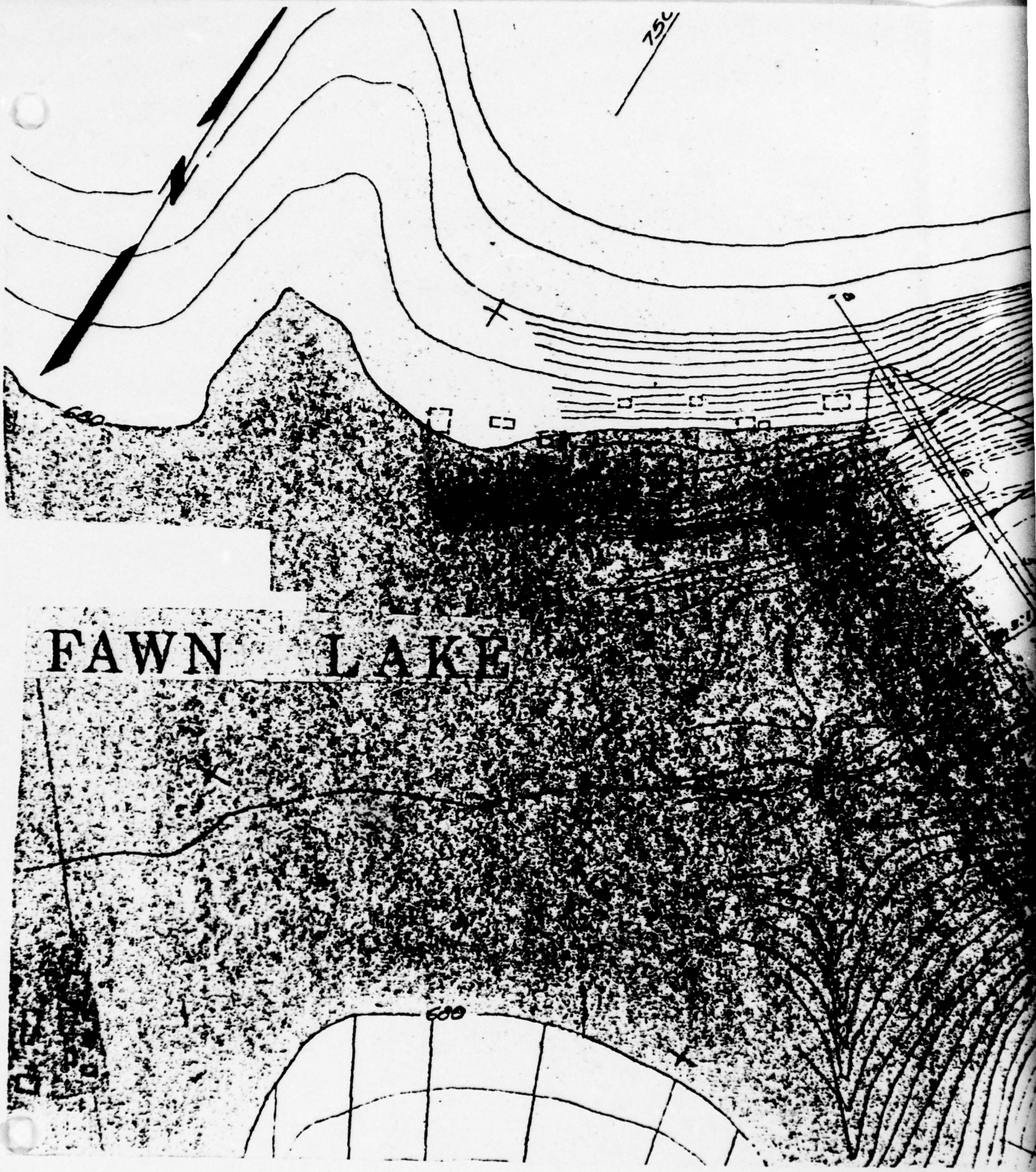
REGIONAL LOCATION PLAN

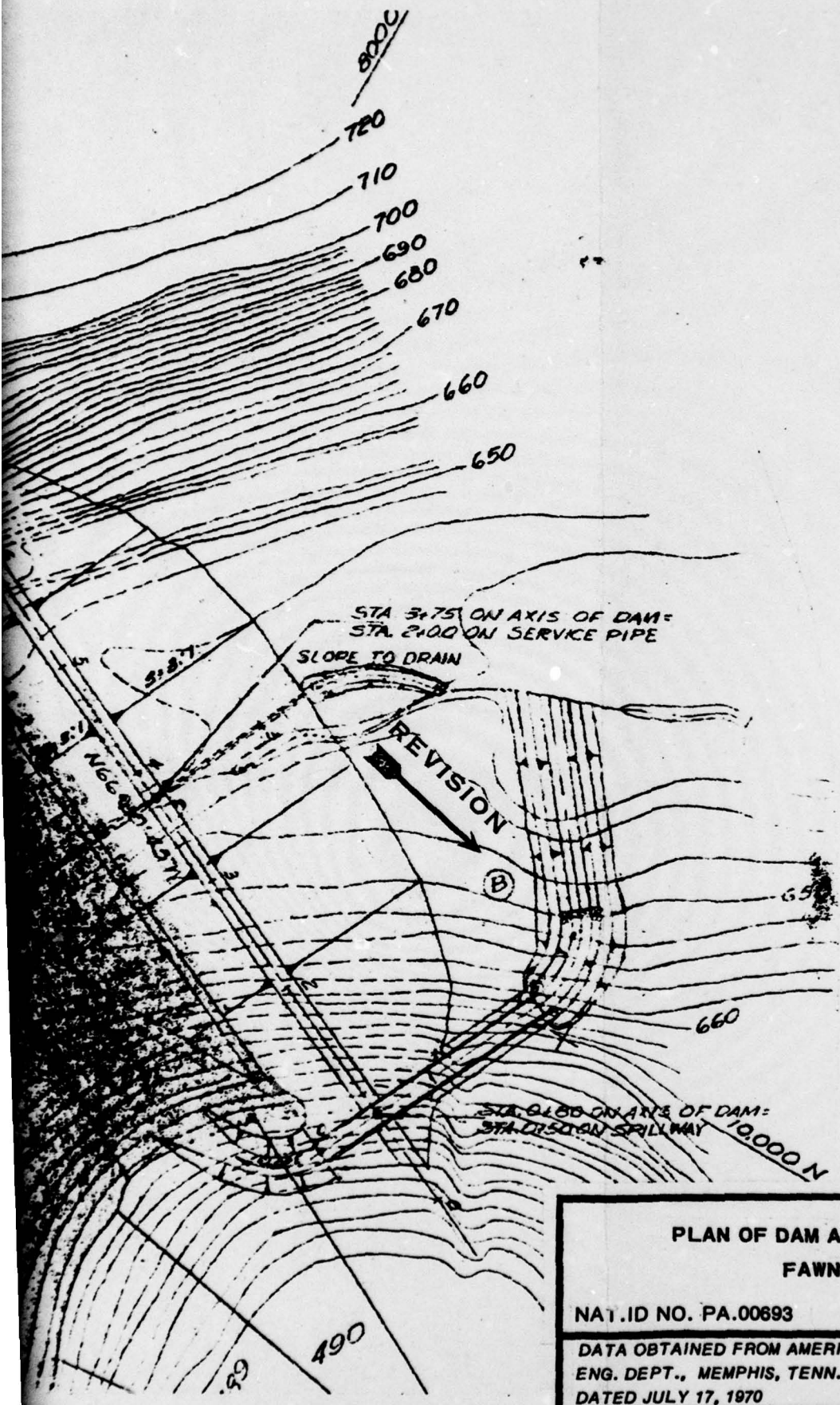
FAWN LAKE DAM

NAT. ID NO.PA.00693 SCHUYLKILL COUNTY

DATA OBTAINED FROM U.S.GEOLOGICAL SURVEY QUAD SHEET ENTITLED: FRIEDENSBURG, PENNA., REV.1968

PLATE 1


FAWN LAKE

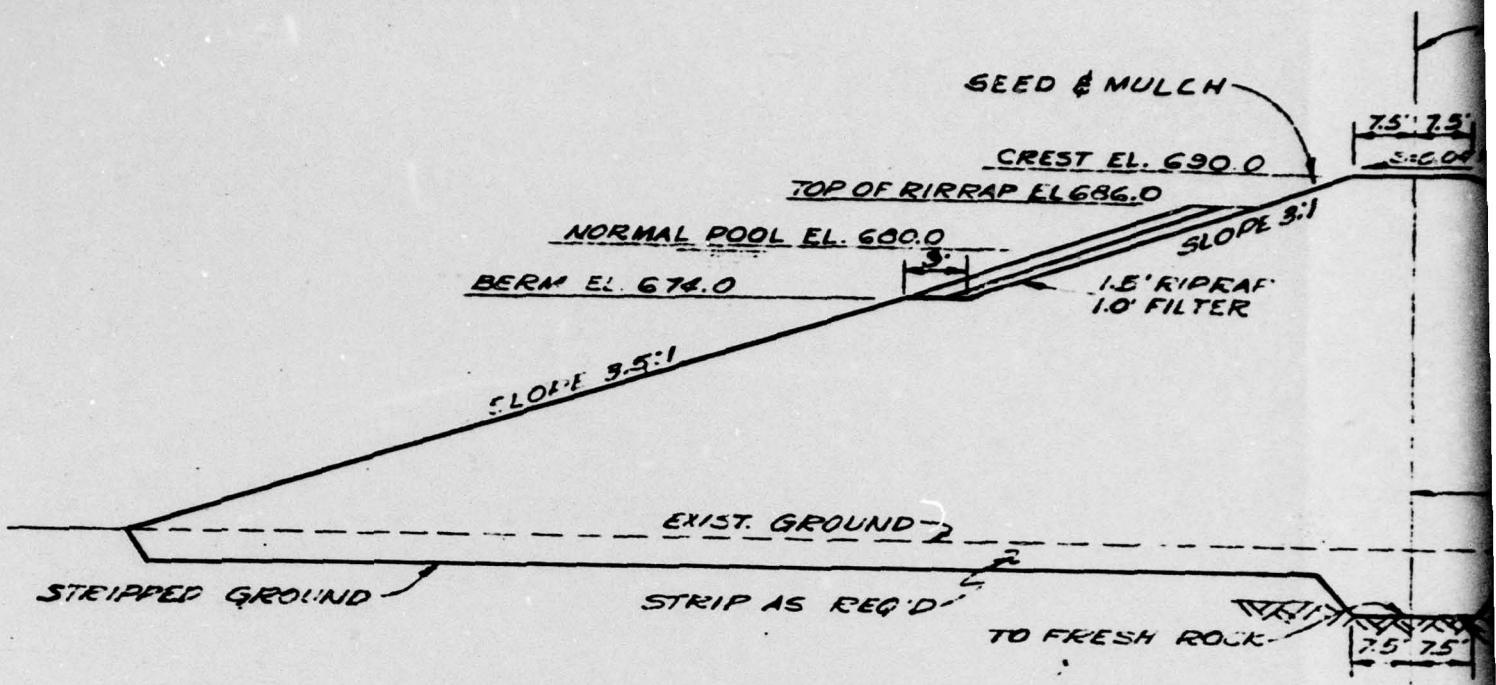


PLAN OF DAM AND APPURTENANCES
FAWN LAKE DAM

NAT.ID NO. PA.00693 SCHUYLKILL COUNTY

DATA OBTAINED FROM AMERICAN REALTY SERVICE CORPORATION, ENG. DEPT., MEMPHIS, TENN., DWG. NO. 7470-D-1, SHEET 1 OF 5 DATED JULY 17, 1970

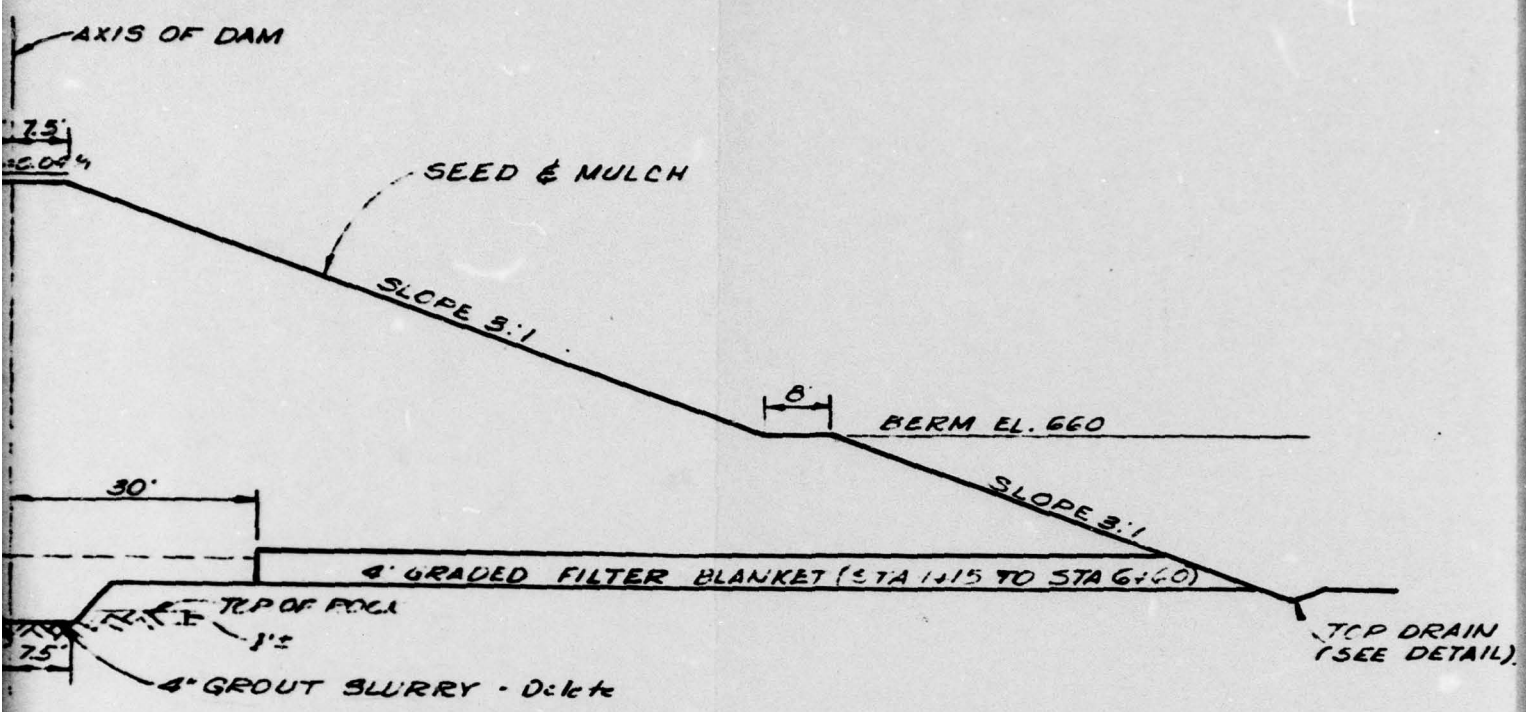
	2	PLATE 2



REVISION

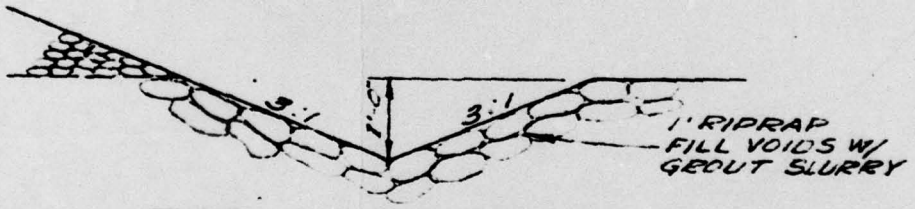
TYPICAL SE

SCALE 1"=20'



SECTION Ⓐ

1"=20'



TOE DRAIN DETAIL

SCALE 1/2 - 1'-0"

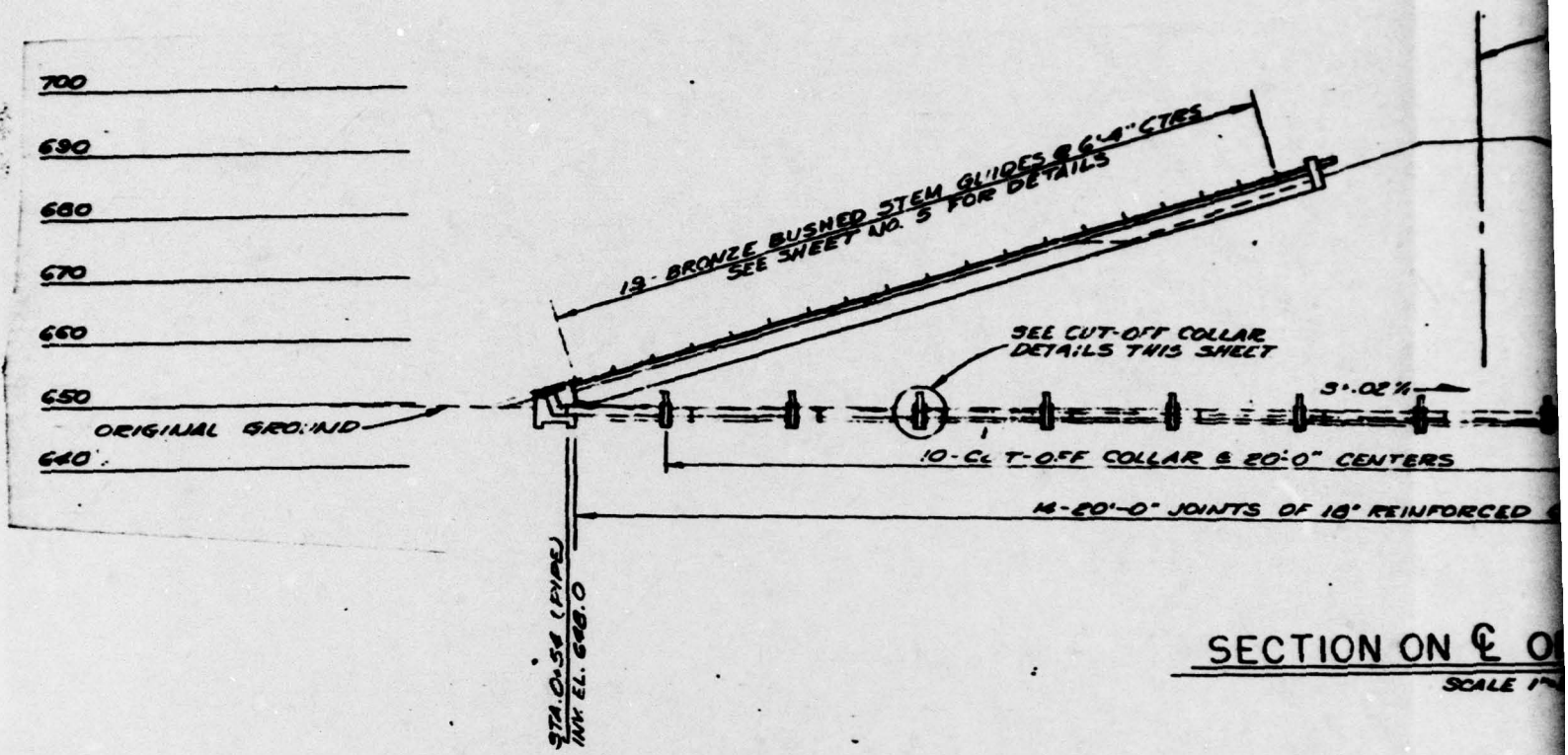
TYPICAL EMBANKMENT SECTION

FAWN LAKE DAM

NAT. ID NO. PA.00693 **SCHUYLKILL COUNTY**

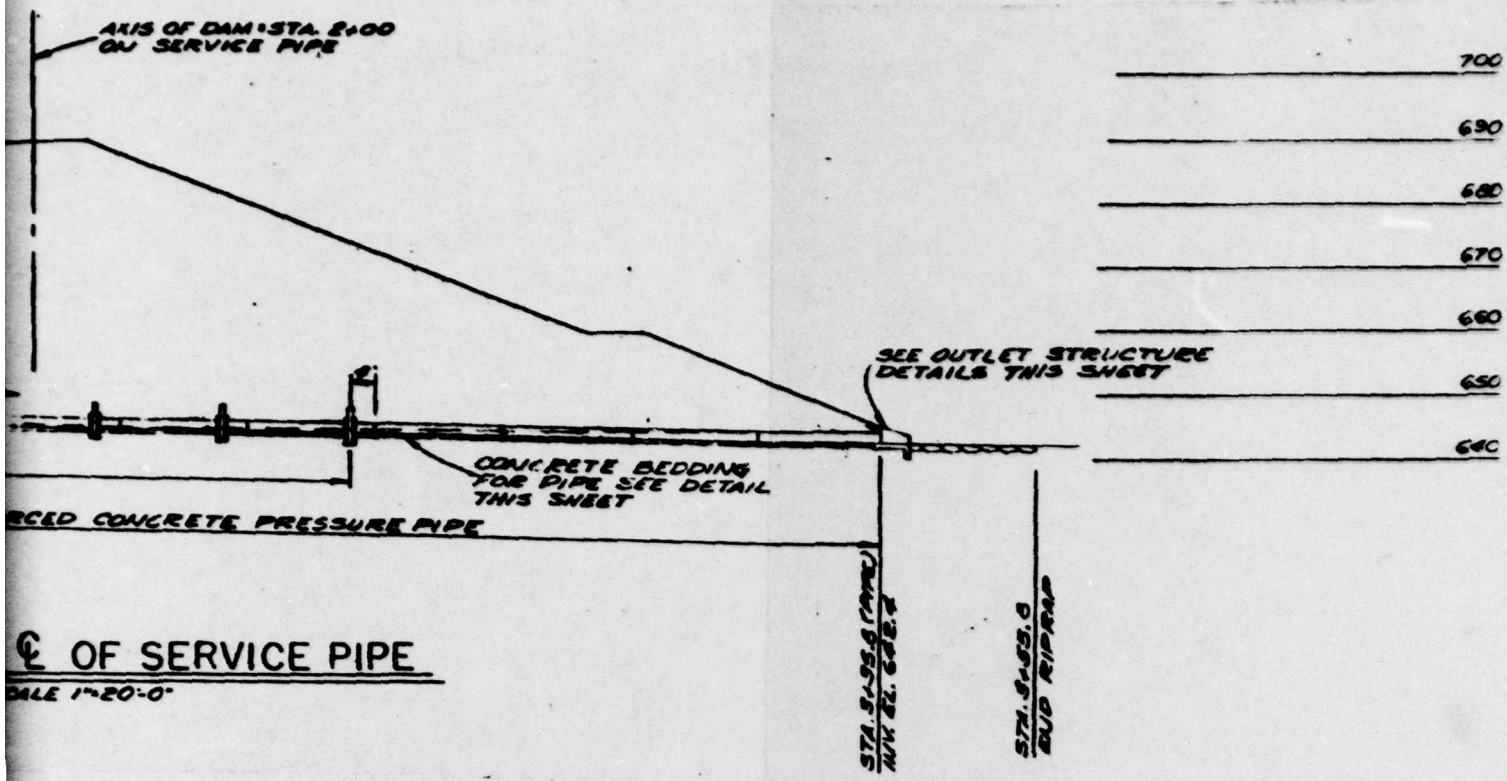
DATA OBTAINED FROM AMERICAN REALTY SERVICE CORPORATION, ENG. DEPT., MEMPHIS, TENN., DWG. NO. 7470-D-1, SHEET 1 OF 5 DATED JULY 17, 1970

PLATE 3



SECTION ON ℄ O

SCALE 1"



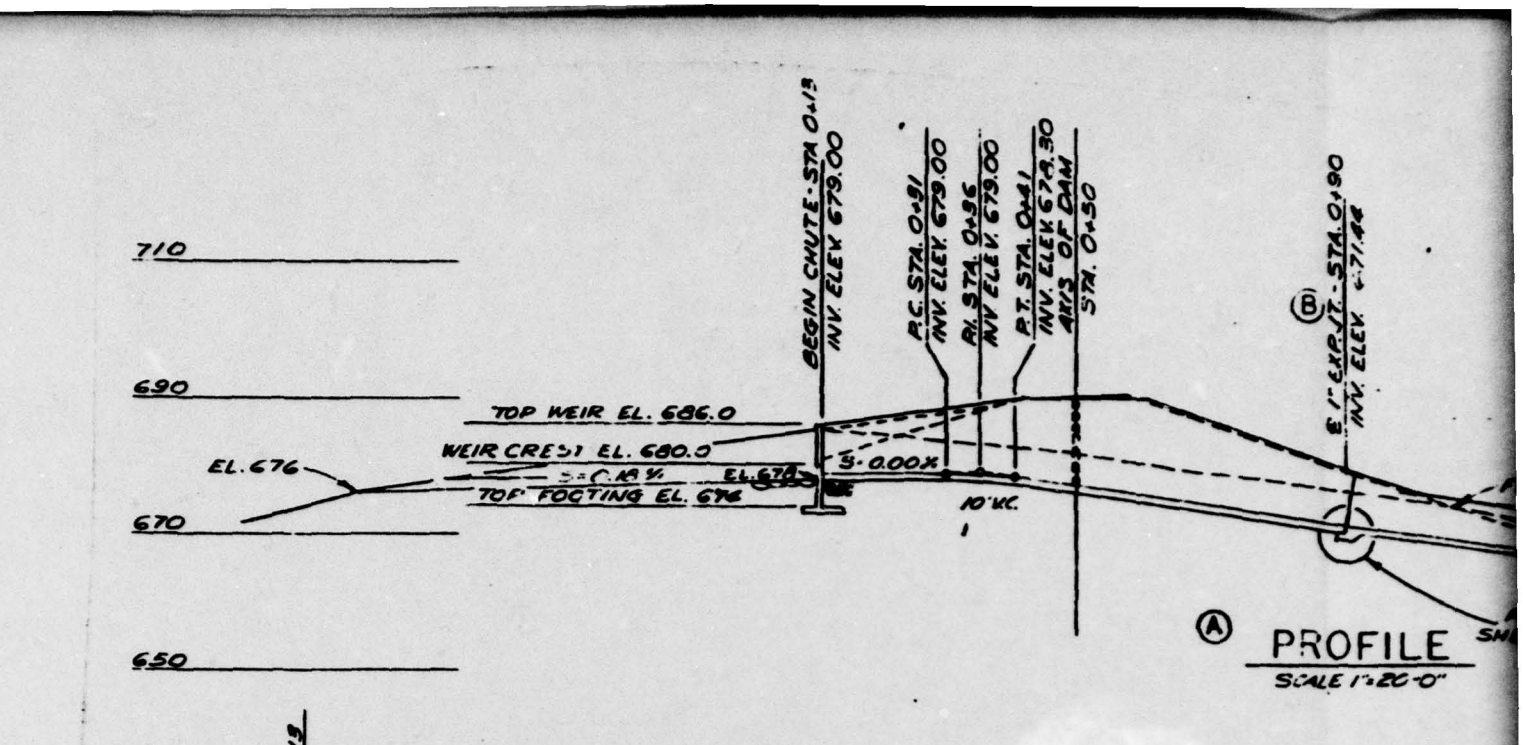
POND DRAIN SECTION
FAWN LAKE DAM

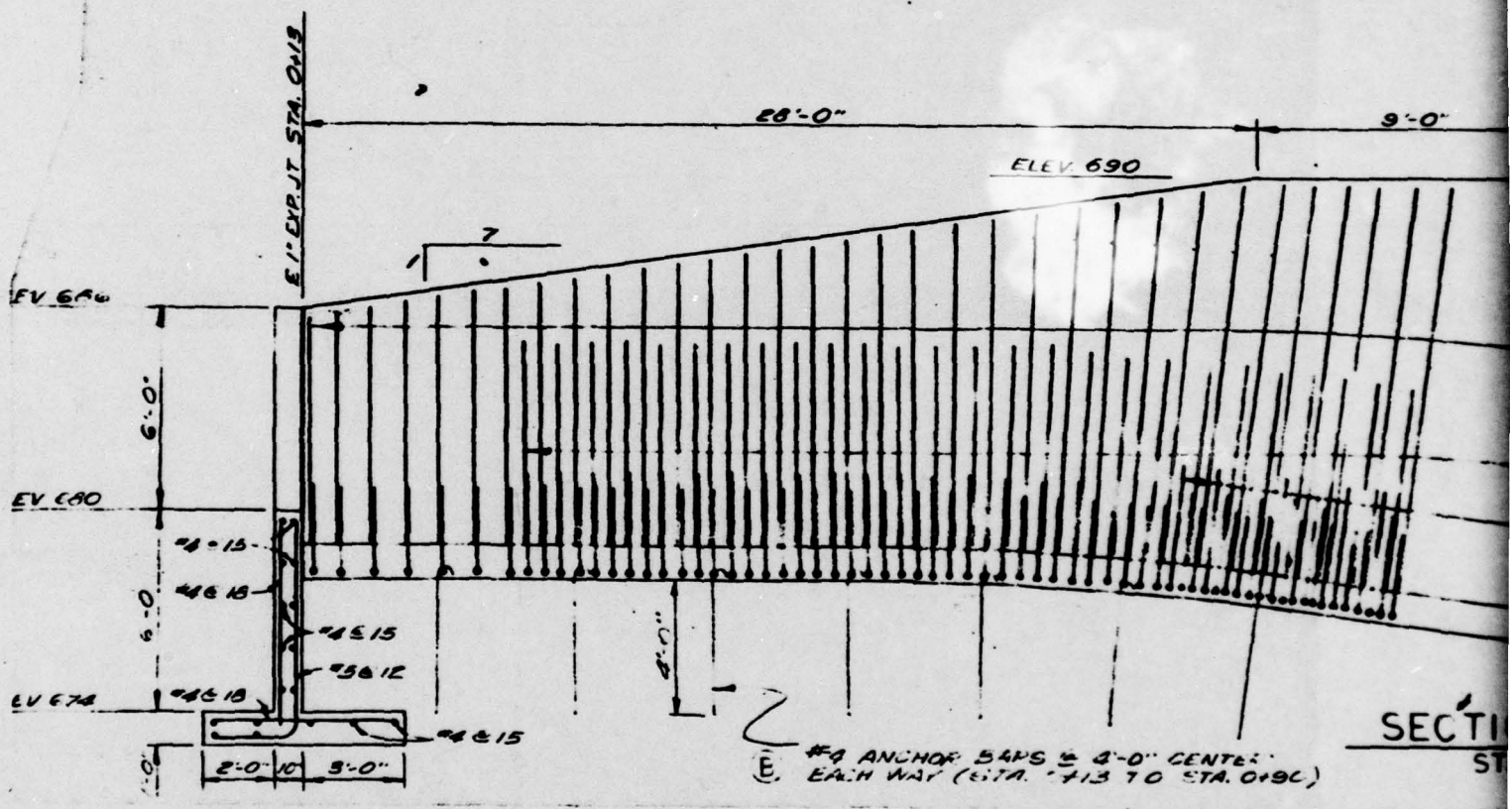
NAT. ID NO. PA.00693 SCHUYLKILL COUNTY

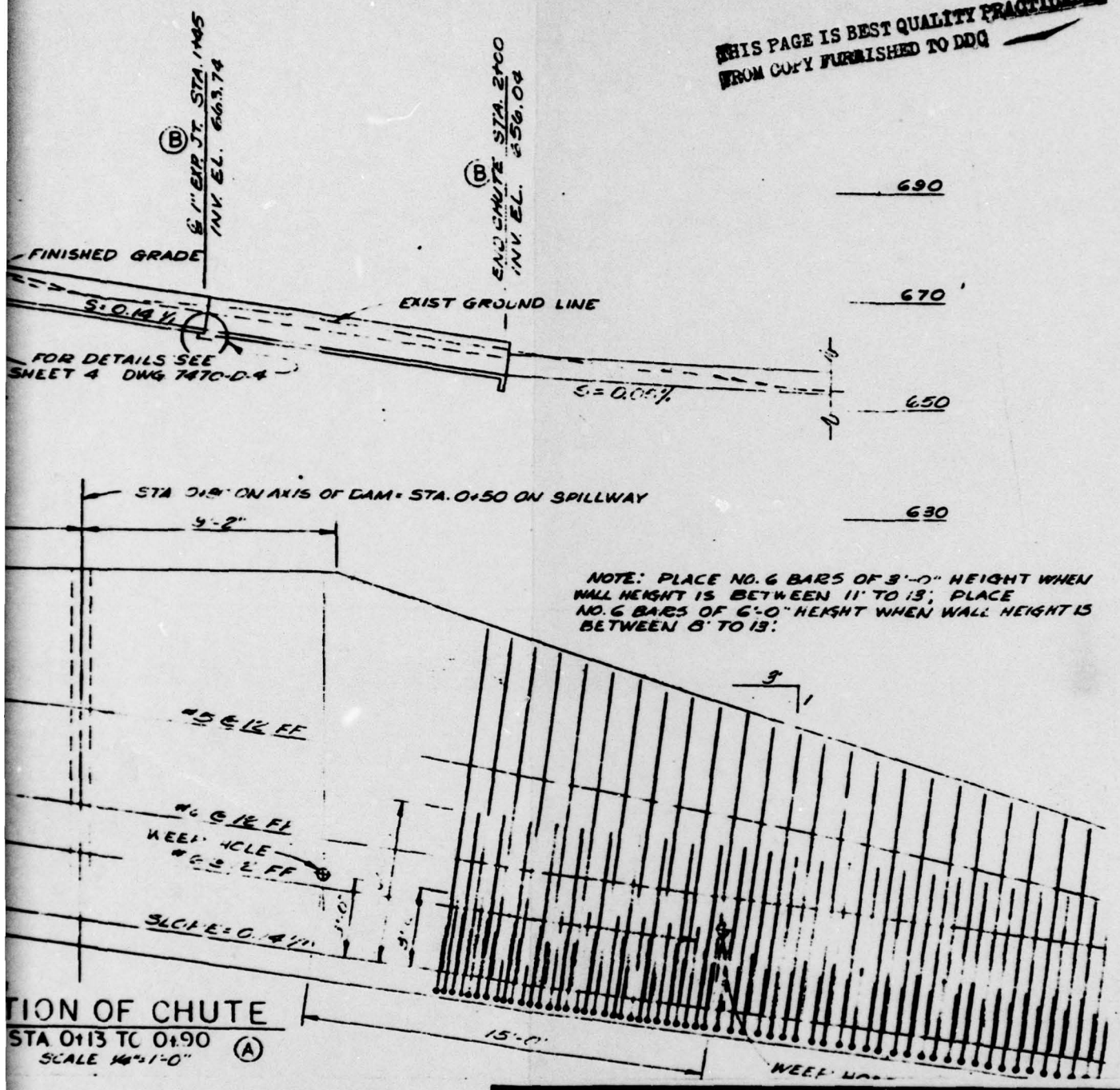
DATA OBTAINED FROM AMERICAN REALTY SERVICE CORPORATION, ENG. DEPT., MEMPHIS, TENN., DWG. NO. 7470-D-4, SHEET 4 OF 5, DATED JULY 17, 1970

2

PLATE 4







TION OF CHUTE
STA 0+13 TO 0+90 (A)
SCALE 1/4"=1'-0"

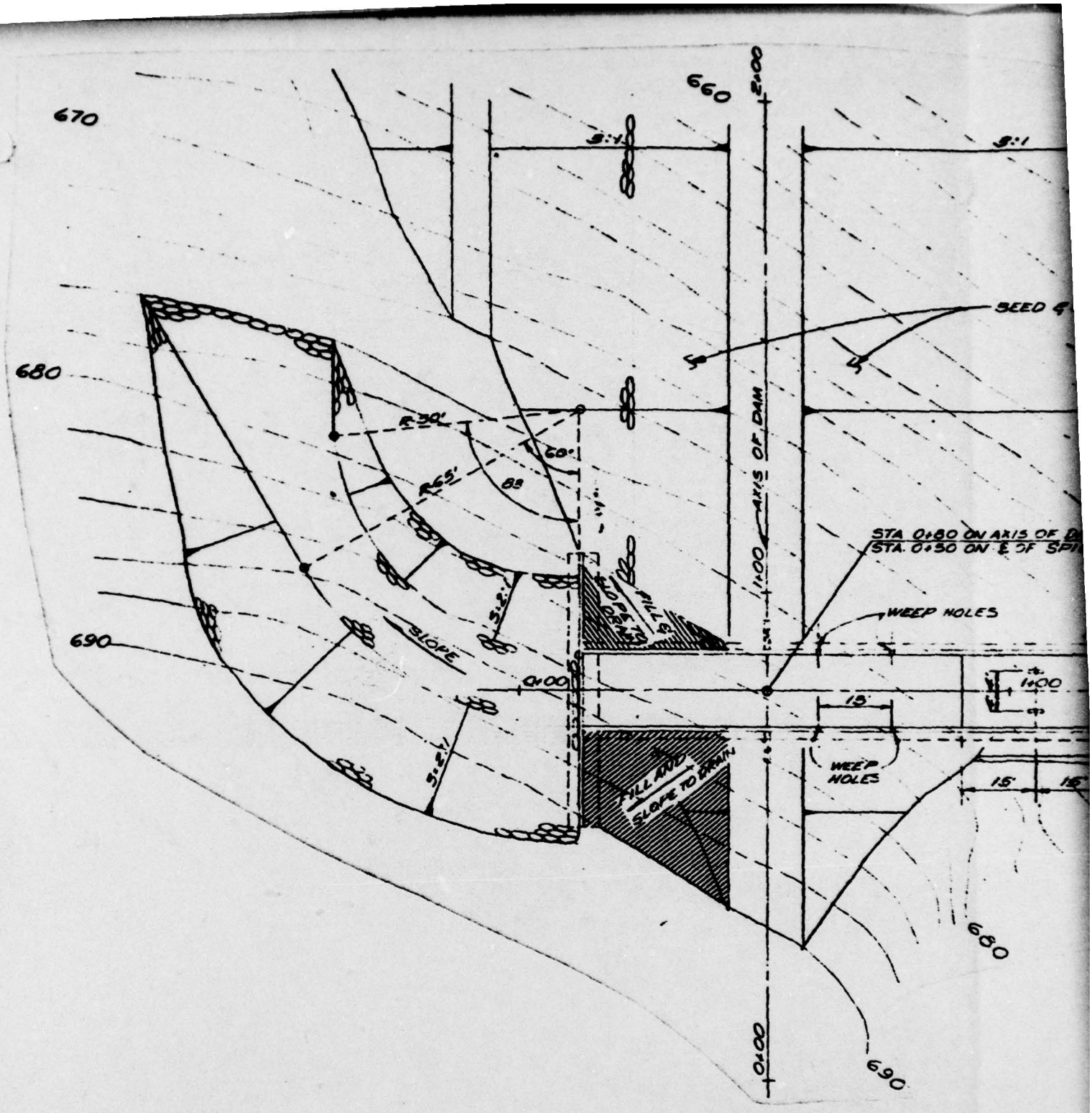
SECTION OF EMERGENCY SPILLWAY
FAWN LAKE DAM

NAT. ID NO. PA.00693 **SCHUYLKILL COUNTY**

DATA OBTAINED FROM AMERICAN REALTY SERVICE CORPORATION, ENG. DEPT., MEMPHIS, TENN., DWG. NO. 7470-D-3, SHEET 3 OF 5, DATED JULY 17, 1970

2

PLATE 5



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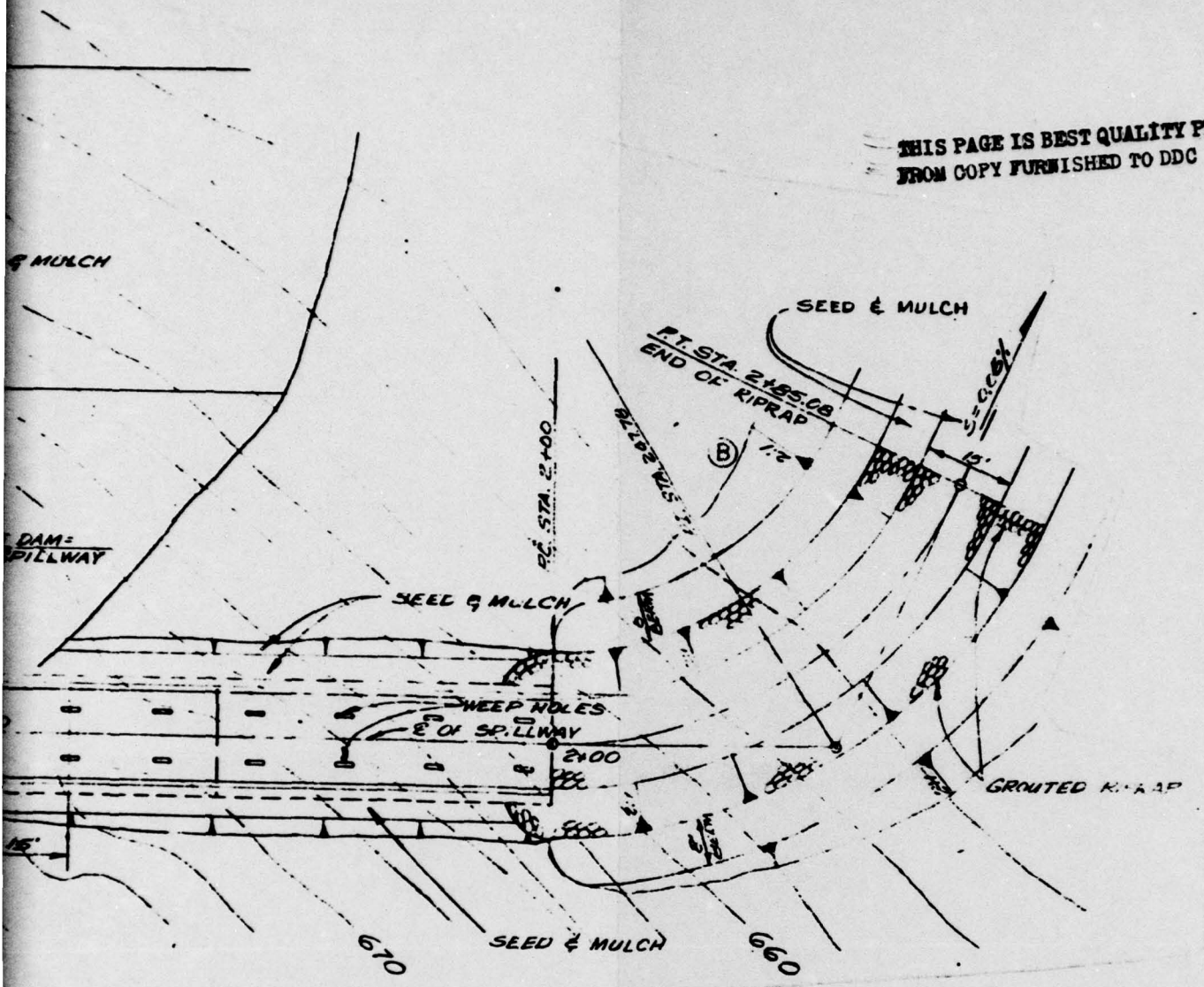


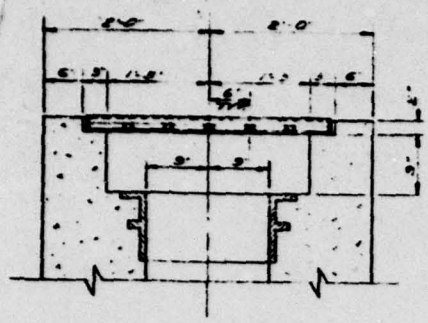
PLAN OF EMERGENCY SPILLWAY

FAWN LAKE DAM

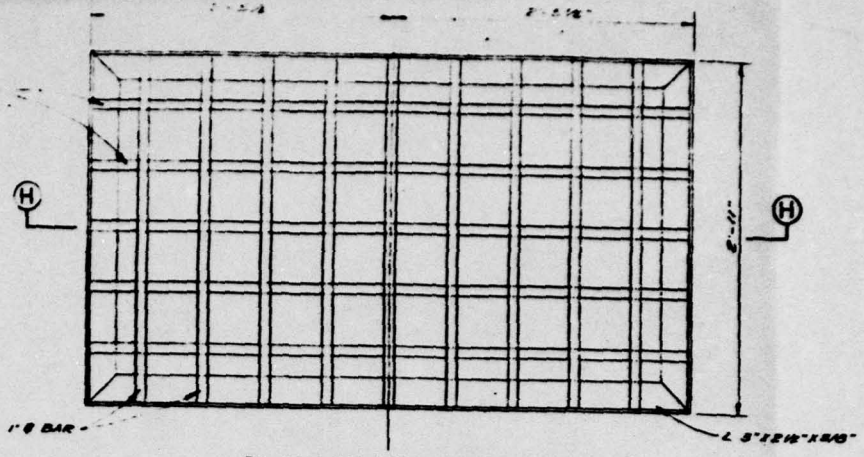
NAT. ID NO. PA.00693 **SCHUYLKILL COUNTY**

DATA OBTAINED FROM AMERICAN REALTY SERVICE CORPORATION ENG. DEPT., MEMPHIS, TENN. DWG. NO. 7470-D-3, SHEET 3 OF 5 DATED JULY 17, 1970

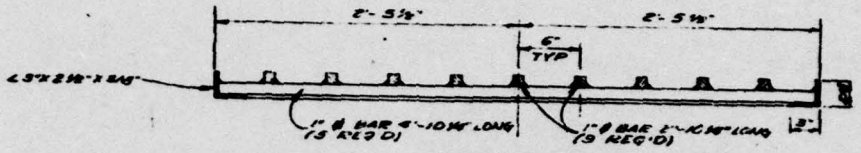
PLATE 6



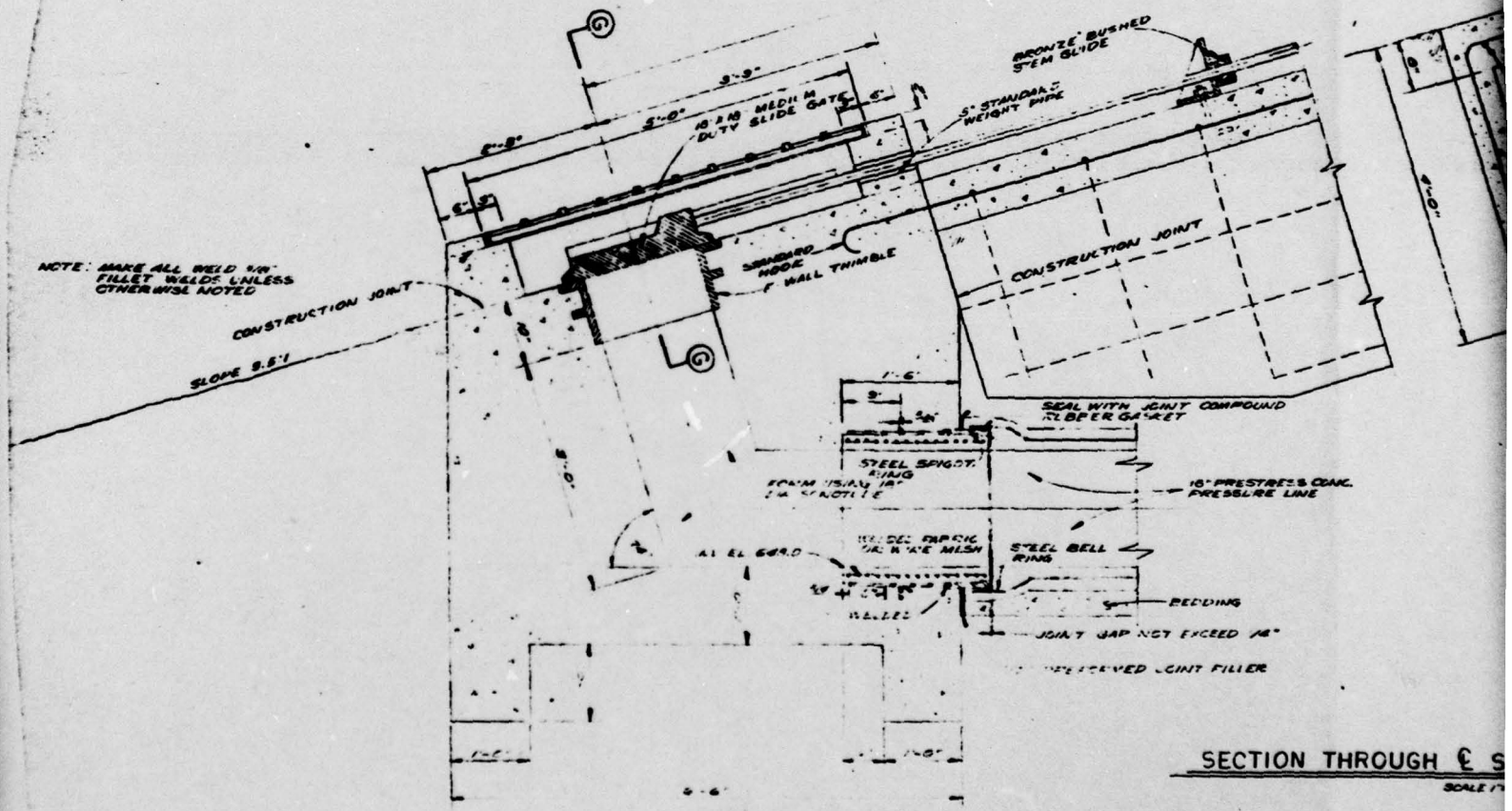
SECTION G-G
SCALE 1"=1'-0"



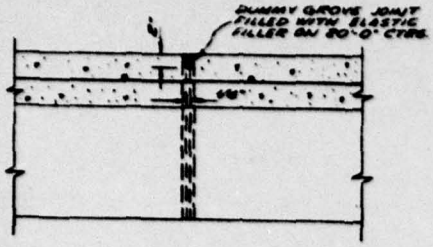
PLAN OF TRASH RACK
SCALE 1½"=1'-0"



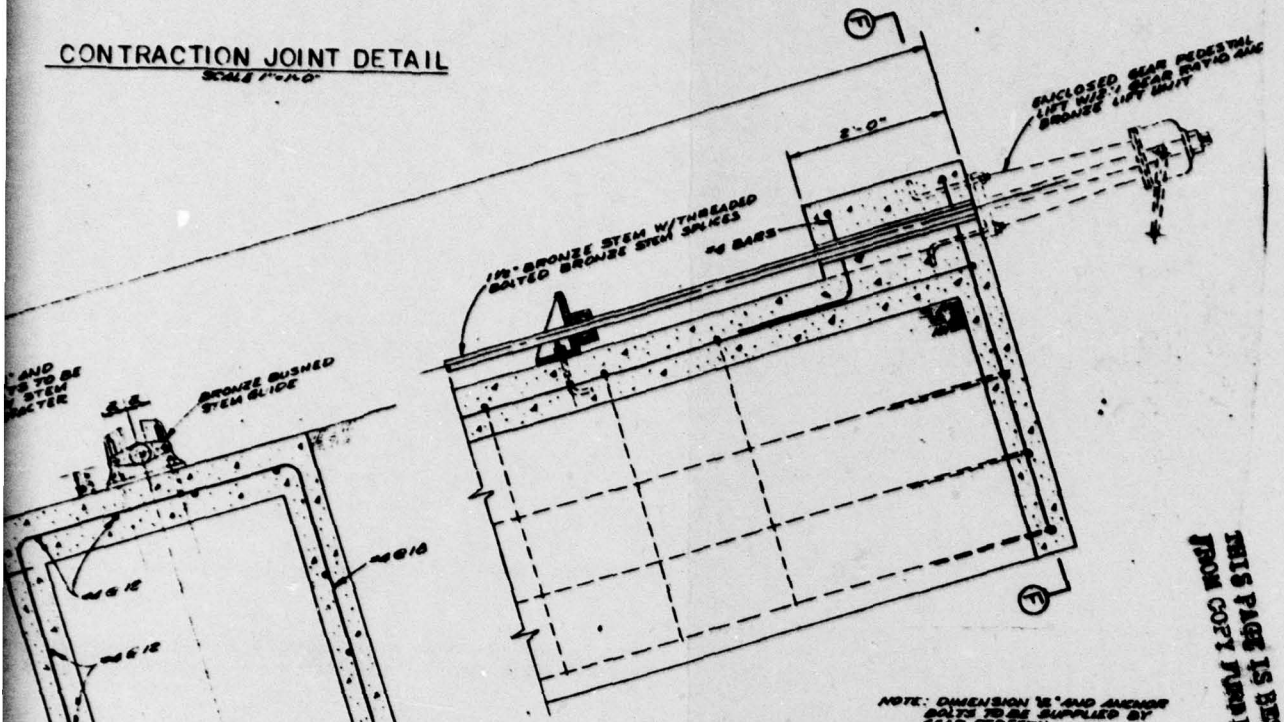
SECTION H-H
SCALE 1½"=1'-0"



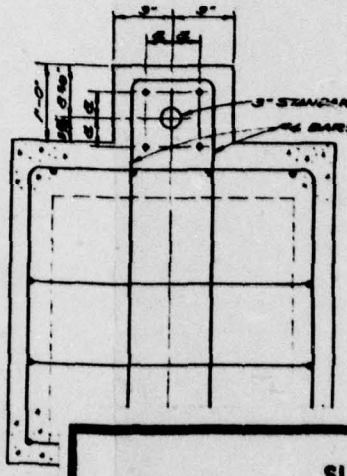
SECTION THROUGH ℄ S
SCALE 1"



CONTRACTION JOINT DETAIL



NOTE: DIMENSION "B" AND ANCHOR BOLTS TO BE SUPPLIED BY GEAR PEDESTAL



SLIDE GATE ASSEMBLY

SLUICE GATE DETAILS
FAWN LAKE DAM

NAT. ID NO. PA.00693 SCHUYLKILL COUNTY

DATA OBTAINED FROM AMERICAN REALTY SERVICE CORPORATION, ENGINEERING DEPT. MEMPHIS, TENN. DWG. NO.7470-D-5, SHEET 5 OF 5, DATED JULY, 1970

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PLATE 7

APPENDIX

F

SITE GEOLOGY
FAWN LAKE DAM

The Fawn Lake Dam is located in the Appalachian Mountain section of the Valley and Ridge Physiographic Province. The bedrock at the dam site is reported to consist of the sandstones and shales of the Devonian Trimmers Rock and Catskill Formations (See Plate F-1). These units are bounded on the north and south by the Devonian Mahantango and Marcellus Formations. Bedding is reported to be folded into a broad open syncline trending N 70 E, with the dam located on the south dipping limb (Wood and Kehn, 1968). No jointing data are available for the dam site, but a primary joint set in this region is reported as usually striking parallel to bedding, while dipping perpendicular to the bedding surface (Wood, 1973). No significant faults have been reported in the Devonian rocks in this area.

Only very limited Pleistocene deposits of glacial outwash have been reported as occurring in the region (Leverett, 1957); any significant deposits in the vicinity of the dam structure are assumed to have been removed during the construction.

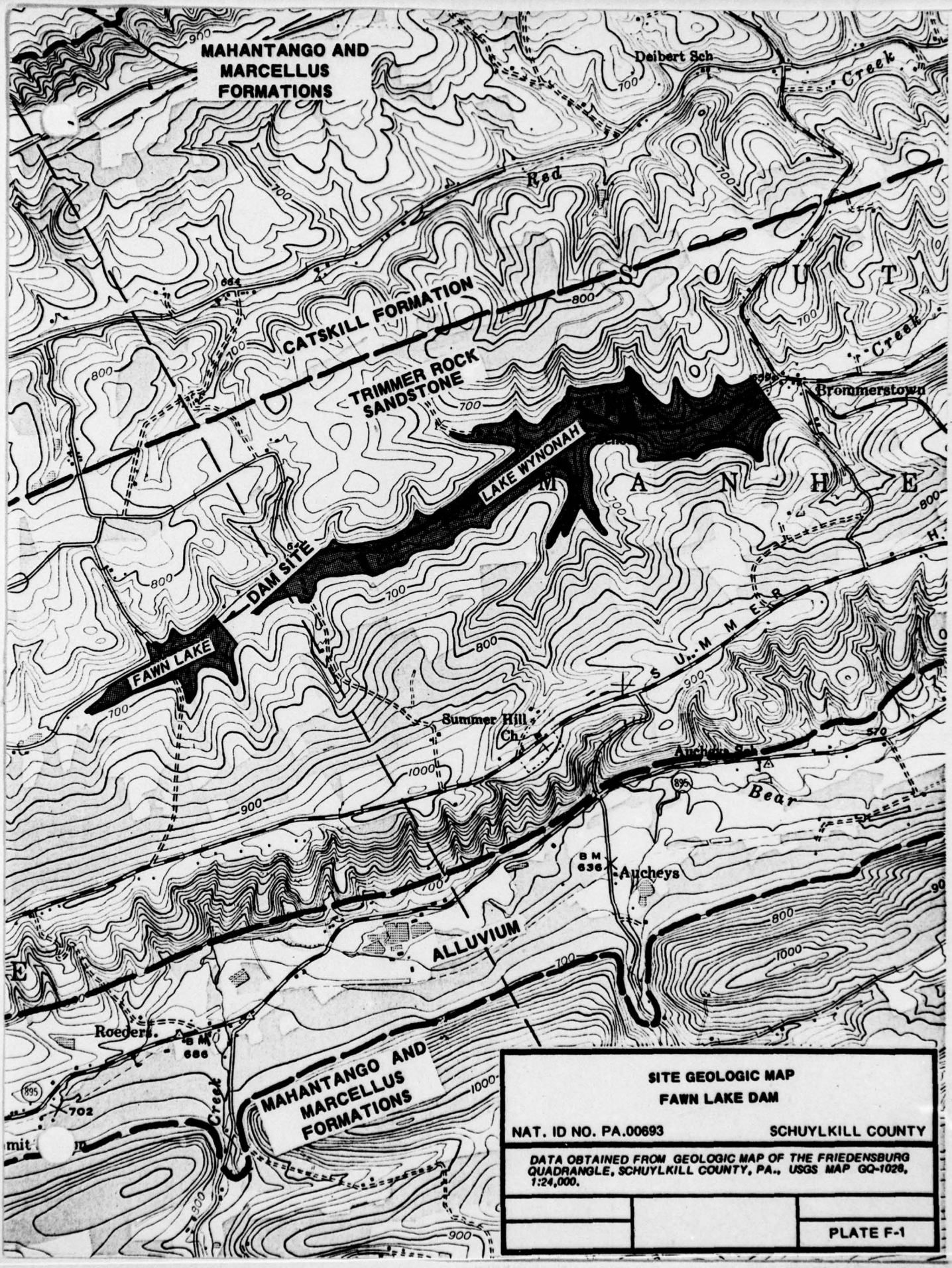
Foundation seepage does not appear to be a major problem. A small amount of seepage may occur through joints that act as a zone of groundwater transport beneath the structure striking at the same nonparallel angle to the dam.

References:

1. *Jewell, G. K., and Associates, Soils Engineering Consultants, Columbus, Ohio, 1970, "Subsurface Investigation, Lake Wynonah, Schuylkill County, Pennsylvania: Report to American Realty Service Corporation, Memphis, Tennessee."*

2. *Wood, G. H., 1973, Geologic Map of the Friedensburg Quadrangle, Schuylkill County, Pennsylvania: USGS Map 1:24,000.*

3. *Wood, G. H., and Kehn, T. M., 1968, Geologic Map of the Swatara Hill Quadrangle, Schuylkill and Berks Counties, Pennsylvania, USGS Map GQ-689, 1:24,000.*



SITE GEOLOGIC MAP
FAWN LAKE DAM

NAT. ID NO. PA.00693 SCHUYLKILL COUNTY

DATA OBTAINED FROM GEOLOGIC MAP OF THE FRIEDENSBURG QUADRANGLE, SCHUYLKILL COUNTY, PA., USGS MAP GQ-1028, 1:24,000.

PLATE F-1